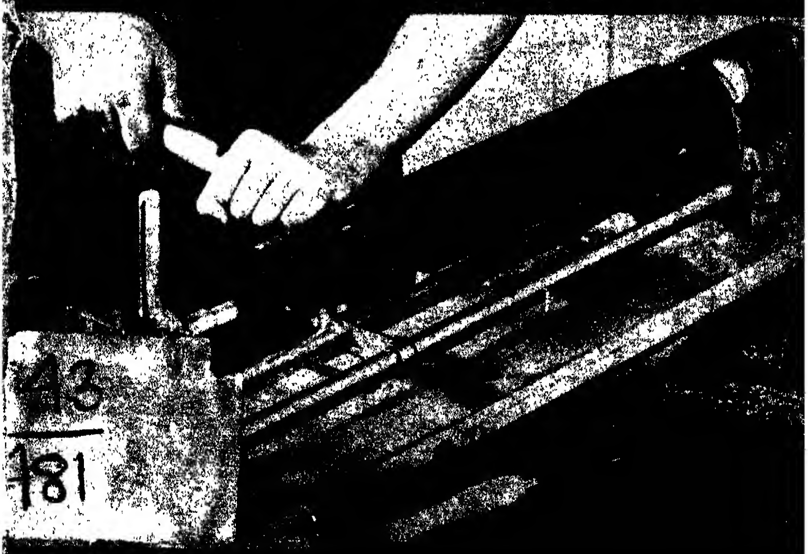
AN ARCO HANDYBOOK

WOODTURNING



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ARCO HANDYBOOKS

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Woodturning

AN ARCO HANDYBOOK

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Contents

Foreword

In these days of factory produced articles and automation in industry, we are inclined to overlook many of the ancient crafts. Articles made in wood have always given a great source of satisfaction to those who manufacture them and in particular when they are made by one's own pair of hands. The primary object of this volume is to inform its readers on the correct and easiest approach to this absorbing hobby of woodturning, the use of turning tools and how to get the best out of your lathes whether they be large or small.

I have spent many years mastering the craft and am always willing to accept any new ideas. I therefore hope that the reader will also be able to learn from my own experiences.

I should like to express my appreciation for the help given to me by the following in the production of this book: Coronet Tool Co., Derby; S. N. Bridges & Co. Ltd., London; Black & Decker Ltd., Harmondsworth, Middlesex; Rockwell Manufacturing Co., Pittsburgh, Pa., U.S.A.; Millers Falls Co., Massachusetts, U.S.A.

In conclusion, I hope that this book will prove to be of lasting value and a source of inspiration to all of those interested in woodturning.

Barnstaple, Devon

CHAPTER ONE

History and origin

IF you refer to your dictionary, you will find it defines 'turnery' as the art of shaping wood or ivory by means of a lathe, and that a lathe is a machine for shaping wood or ivory, and that is just about right; but I think perhaps a little more explanation would make the whole business of lathes and woodturning much more interesting.

For centuries man has made things of wood, but perhaps the lathe alone has been responsible for more beautiful things in the home and in places of worship, than any other single woodworking tool. Articles of furniture found in Ancient Egypt, show quite clearly that the lathe was in use in the years before Christianity.

One of the earliest types of lathe can still be found in use in the Far East, particularly in India. This consists of two conveniently placed tree trunks each holding a pointed centre. Between these two centres a length of wood is placed with a length of cord wound around it and the ends are held by an assistant, who causes the wood to spin in a two and fro action. The turner, who sits on a stool, holds his cutting tools between his feet and manipulates the cutting action by means of his hands.

Another type of lathe to be found in India, and mostly used for turning bowls, etc., works in a vertical plane. The action here is quite different, the turner sits on the ground and turns the wood with his feet and at the same time uses the cutting tools with his hands, very much like the potter using a kick wheel. We can well imagine that at times this method can get quite complicated.

One of the earliest lathes to be found in Britain, was the bow lathe. Here the wood was worked in a to and fro action, by means of a cord wound around the work and attached

by both ends to a springy piece of wood to form a bow. This bow was then pushed backwards and forwards by an assistant causing the work to rotate in a to and fro movement. The turner cut the wood whenever the work rotated towards him.

There were other types of lathes in use in bygone days, but the method of operation was very similar to those mentioned, and the to and fro action remained until quite recent years.

An early lathe in Britain is the Bodgers lathe, which until recently was still to be found in use in Buckinghamshire and which is very similar to a primitive lathe, but is portable. Two vertical pieces of wood, each containing a centre point are fixed to a wooden bench, one being adjustable so that the distance between centres can be varied. A length of cord is passed around the wood to be turned, which is placed between centres, one end being looped around the operator's foot and the other fixed to a conveniently springy bough of a nearby tree. Thus, when the foot is pushed down

PRINCIPAL PARTS OF A LATHE

(Key to diagram on facing page)

1. Pulley guard
2. Headstock
3. Headstock spindle
4. Index pin
5. Lathe bed
6. Tool rest base
7. 12 in. tool rest
8. Tool rest base clamp
9. Tool rest clamp
10. Tailstock base
11. Tailstock
12. Tailstock spindle
13. Tailstock spindle clamp
14. Tailstock feed handle
15. Tailstock clamp
16. Set-over screw
17. Headstock wrench
18. 4-in. tool rest
19. Spur centre
20. Cup centre
21. Allen wrench
22. 3-in. faceplate
23. Driving belt

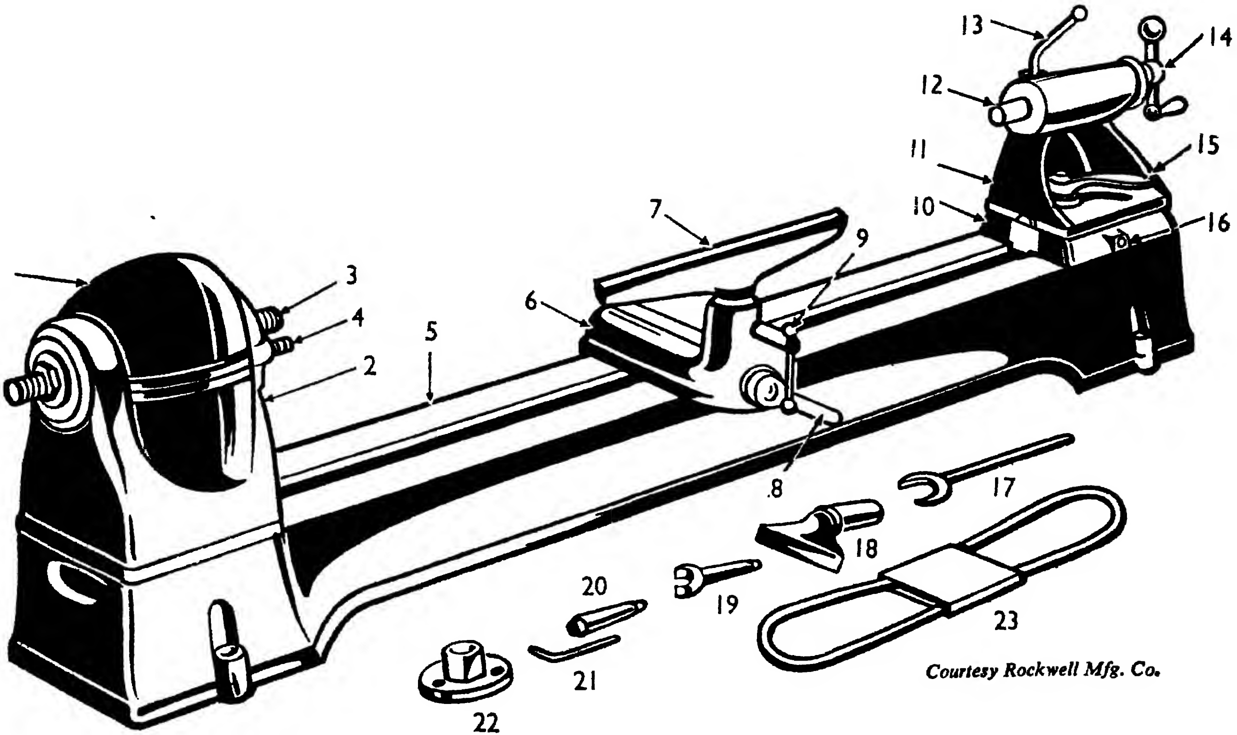


Figure 1. 'Delta' 12 in. woodturning lathe and parts.

the cord rotates the work in one direction and when the pressure of the foot is released, the spring in the bough causes the work to rotate in the opposite direction. It's all very much like the Eastern model. It is when the work is being rotated by the return spring of the bough that the actual cutting is done.

A few years ago, the furniture trade had practically all their chair legs made on such a lathe by 'bodgers' as the woodturners were called. The lathe was set up in the open wherever suitable wood could be found. The wood was cut to length, split into suitable billets, turned and air dried all on the same site. All the suitable wood being used up, the bodger and his lathe would move to another pitch.

Next follows the treadle lathe which had one great improvement over the Bodgers in that the work rotated in the same direction all the time. This made it possible for the turner to work much more comfortably and also enabled lathes to be made more portable, although once a woodturner had set up shop, he didn't usually move his lathe very far.

All the types of lathe mentioned were made entirely of wood, except for the headstock bearings. It was not until the machine age that the main parts of a lathe, that is the headstock, tailstock and tool rest, were made of metal, to withstand continuous running conditions, although the bed of the lathe was still made of wood. This consisted of two lengths of 10 in. × 2 in. boards, placed 2 in. apart, on edge.

Today the woodturning lathe, which the amateur is likely to use, is made entirely of metal, with bearings which will stand continuous high speed running, and we do not have to find a very patient assistant to keep the thing running, whilst he is showered with wood dust and shavings as of old. If you are wondering what type of work was carried out on these early lathes, just take a look around the antique shops and museums and you will see many fine examples of

turning which were done on the old bodgers lathe or bow lathe.

Also, you can find very ornate bowls and plates from the Orient, which were turned on very crude lathes indeed, and are still being made by such methods.

The art of woodturning is certainly very fascinating. Every day you can see something which is an example of the woodturner's art. It may be a simple door knob, a William and Mary table with beautifully turned legs or perhaps those old skittles down at the local public house.

It will become obvious to you that woodturning is a very ancient craft and it is interesting to note that the word 'lathe' first appeared in the English language round about 1611. I have been unable to find out what the woodturner called it before that, but no doubt the ancients had a good name for it. Nevertheless, as a craft it still has a wide scope and it will provide you with the means of expressing your own personality, giving pleasure and satisfaction to yourself and others.

CHAPTER TWO

Requirements of a lathe

Bearing Centres – Faceplates – Tool Rests – Speeds

I HOPE that in the preceding chapter your interest in woodturning has been roused and that you wish to 'do it yourself', as the various magazines and papers say these days.

Obviously, the old pole or Bodgers lathe will not be your choice for your workshop, so let us have a look at the basic requirements of your lathe to enable you to start turning.

As I have already said, the main items of any lathe are the headstock, tailstock, tool rest and lathe bed.

Headstock. This should have two good bearings, the left-hand one being, preferably, a ball thrust race, as this has to take a considerable amount of hard work when wood is being turned between centres. This is because the tailstock is held firmly into the wood and this exerts a pressure towards the left-hand side of the lathe. The right-hand bearing of the headstock is usually referred to as the main bearing and takes the thrust in a vertical plane.

It will be obvious that in turning between centres, or on a faceplate and when the chisel or gouge is cutting the wood, there is a tendency to lift the wood upwards, hence the need of a very good bearing here. I prefer this to be of the plain, tapered, adjustable type, so that play in the bearing can be kept to a minimum. Quite a few of the older lathes and particularly lathes used in the trade, have this bearing adjustable and made of phosphor bronze, some being very large indeed. Unfortunately, if the bearings are too large, the lathe will require quite a lot of horsepower to keep it going and I am sure the amateur will not want this type of equipment in the garden shed or workshop.

The headstock mandrel, as the main shaft is called, is usually fitted with a graduated pulley wheel of two, three or four steps to enable various turning speeds to be obtained.

I should mention here, that there are a few lathes where the electric motor is actually the headstock and that the various turning speeds are obtained by altering the speed of the motor by a variable resistance, or, as in the case of one American lathe, by means of a variable gearbox, built in the motor headstock assembly. The usual arrangement is by belt and pulley to a remote power supply.

To rotate the wood, there must be a pronged centre, fitted into the end of the headstock, either screwed in or a Morse taper push fit, which is quite common on amateur and professional lathes. These centres vary somewhat in shape according to manufacturers' whims, but are usually two- or four-pronged as shown in the diagram. The centre point should be about a quarter of an inch longer than the driving prongs or fangs, so that wood can be removed from the lathe and easily replaced if required. I prefer to use a four-prong centre, as, quite often, the two-pronged versions are easily twisted if one accidentally digs the tool into the work. I also find the four-prong centre gives a more positive drive in softish wood.

On small lathes, it is advisable to mark the end of the wood to be turned, by knocking the centre into the wood with a mallet before fitting it into the lathe. This prevents damage to the bearing, which could be caused if the tail-stock was overtightened. On larger lathes, the wood is placed between centres and the tailstock is turned and forces the work on to the prong centre, but you must have good bearings to stand this sort of treatment. Of course, when you are doing repetition work, if you are continually removing the centre and driving it into the work to be turned, you can get a little hot around the collar. It is the usual method, in the trade, to mount the wood between centres by guess-work, screw up the tailstock slightly, so

that the wood is lightly held, and rotate the lathe by hand. The operator can easily see if the work is running true. If it isn't, just give it a tap with a piece of wood or your fist until it appears to be turning true. Judge this by eye. Now tighten up the tailstock and all is set.

After all that, perhaps you will appreciate what I am trying to stress about your driving centre. The good centre point will hold the work while you get it mounted dead centre and before the drive starts to rotate the work. Very few centres on the market do the job they are supposed to and it generally falls to the craftsman to shape them to his requirements. Figure 2 shows some typical driving centres although some awkward projects call for original ideas by the operator.

Tailstock. This is on the right of the lathe and its purpose is to hold the dead centre and support the end of the work when turning between centres, e.g. when making chair legs, etc. The tailstock must have two main adjustments. First of all, you must be able to move it bodily along the whole length of the lathe bed, and by means of a clamping device, lock it in any required position. Secondly, the part of the tailstock which holds the dead centre, must also be separately adjustable. This is usually by a screwed thread which will project or retract the centre and lock in any position. Most centres are held in the tailstock by means of a No. 1 or 2 Morse taper and can easily be removed by passing a tool through the hollow shaft. Some lathes have a self-ejecting device built in. This, of course, simplifies work a great deal.

There are three types of dead centres which are most commonly used, solid, cup and ball-bearing. The solid type have a point ground to 60 or 90 degrees, but have the disadvantage in that they usually work into the wood whilst turning and require continual lubrication and adjustment of the tailstock. The cup centre overcomes some of these disadvantages but unless well lubricated will heat up and

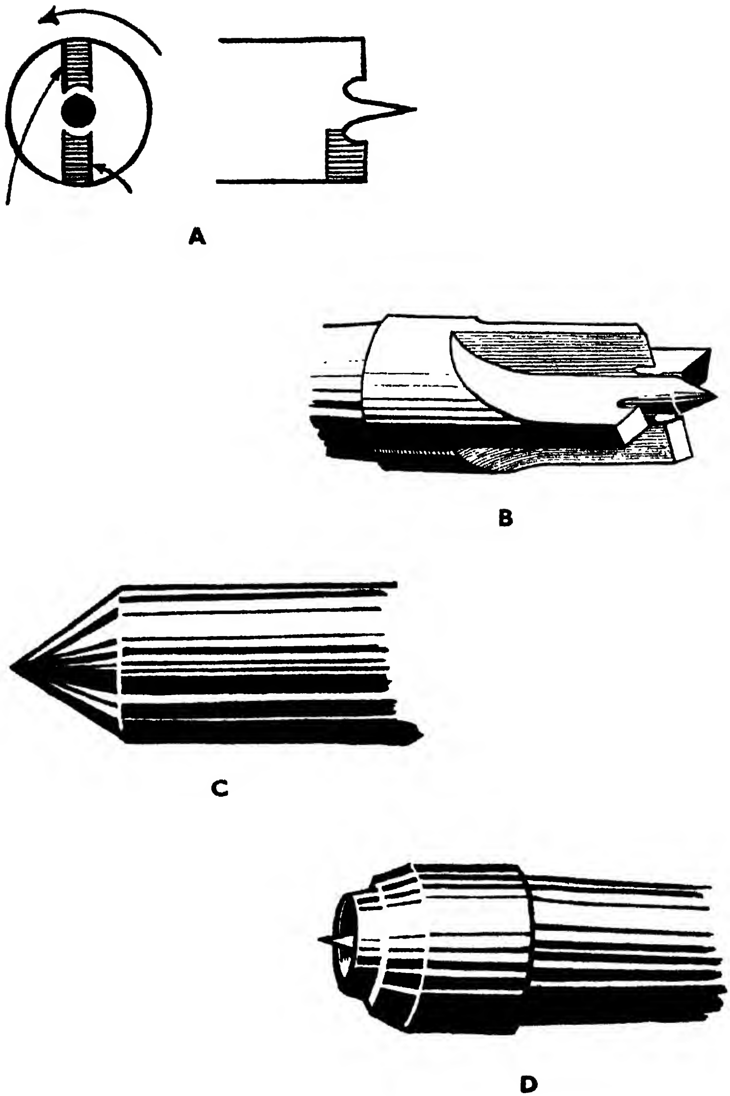


Figure 2. Some typical driving centres. (A) Two pronged centre. (B) Four pronged centre. (C) Plain or solid centre. (D) Cup or ring centre.

burn the work. It must be appreciated that too much tension on the tailstock centre will have the effect of putting undue strain on the bearings at the other end of the lathe. Quite often when turning, you suspect something is wrong with your bearings or driving centre but the real trouble lies in the tailstock end. The ball-bearing centre overcomes all of these disadvantages and can be used continually with no attention whatsoever. They are more expensive than the plain centres but the extra expense is well worth it, for all the advantages obtained.

Some lathes have a tailstock which is easily removed from the bed completely. This is very useful when doing certain faceplate work. At least you do not get your elbow impaled on the dead centre. Lathes manufactured by the Coronet Tool Co. have tailstocks which are held in place by spring plungers and can quickly be released so that they drop away under the bed of the lathe and are well out of the operator's way.

Toolrest. So much then, for each end of the lathe. Now what about the middle, and I mean the tool rest. This is one part which really wants to be strong and well designed, as even in the best of hands it really has to take a hammering. With the small electric drill lathe, quite often this and other parts are made of die cast alloy and for the type of work undertaken this is quite satisfactory, but in larger lathes, say from 24 in. between centres, this is not really strong enough for the job. Cast iron or steel is much more satisfactory.

The actual design of the tool rest is another very important feature. You must have a rest which is easy and comfortable to use. Their design varies quite a lot. I prefer the square type of rest as this gives adequate support for the tools and forms a natural guide for the fingers of my left hand which are holding the tool. Figure 3 will make this point clearer. Some woodturners will not agree on this point, but if you hold your tool lightly, as I want to show you, then the square type answers the purpose

very well. People who hold their tools as if they weigh a ton, may prefer something different. Tool rests are manufactured in various lengths and I would like to recommend having two or three of different length, say 6 in.,

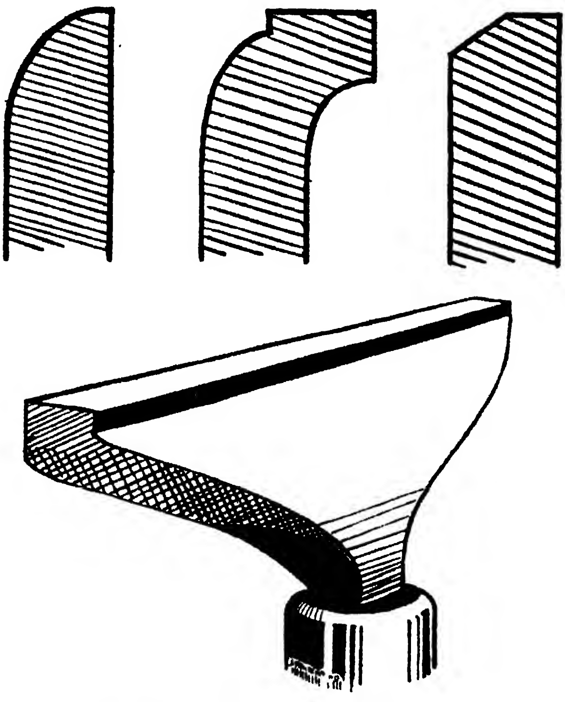


Figure 3. Typical tool rest shapes.

10 in. and perhaps one of 18 in. for long slender work. In the trade, they quite often use a wooden rest running the whole length of the lathe. It is very useful for long work but for the type of work that the amateur is going to do, I would suggest that he leaves this type of rest alone until he has really got used to turning with a smaller more rigid tool rest. Still, if the idea appeals to you, there is no harm in making one up out of hardwood to suit your particular

lathe. For repetition work the wooden tool rest has one great advantage. You can pencil on it details of design so that you do not have to keep referring to a pattern.

In all cases, the tool rest must be easily adjustable for height as this varies according to the type of work you are undertaking, and, of course, it must suit the habits of the operator.

Lathe bed. Some lathes in use in factories and old workshops have a wooden bed consisting of two lengths of 2 in. × 10 in. pine spaced about 2 or 3 in. apart. The headstock is bolted through to one end and the tailstock with tool rests clamped and movable along the remainder, thus making a lathe of some considerable length if required. One feature of the wooden bed is that the whole lathe has a certain amount of springiness, which enables the work to be held more firmly between centres, without continually having to tighten the tailstock. Quite a few craftsmen still prefer this type to the modern all metal lathe. More modern types have pressed steel, flat cast iron, tubular steel or a solid round bar, all of which are quite satisfactory providing they are of ample proportions. I am very much in favour of the solid, round type, as it is much easier to keep clean and does not get blocked up with wood dust and chips.

Faceplates. Salad bowls, egg cups, plates, etc., are just a few examples of the type of work which is done using a faceplate to hold the wood to the lathe. Various methods are used for fixing the work to the faceplate. Two or three woodscrews is the most common. Some people prefer to stick the work to the faceplate and where screw holes would prove to be unsightly, then this method is very helpful. When you next take a walk round the store in your neighbourhood which specializes in woodware, pick up a few wooden bowls or plates and have a good look at their undersides. Some will have bases covered with felt or cork sheet, which is the usual method for hiding screwholes which held the article on the faceplate. Some will have

bases which are polished, indicating some other method of chucking. Again, you may find a bowl which has no obvious clue as to how it was held on the faceplate.

For more general use, the woodscrew chuck is invaluable. This consists of a small faceplate, usually about 2 to 3 in. in diameter and having an ordinary woodscrew fixed to its centre, either by being welded or clamped by a special locking device. The advantage of the latter is that the woodscrew can easily be replaced, if it should be damaged. Another feature of the woodscrew chuck is the ease with which the wood can be readily removed, and in repetition work this is most important. Having just the one central fixing screw, it will be seen that when the wood has been removed, it is quite a simple matter to replace it in its previous position, whereas with the normal type of faceplate, with its multiple screw fixing, it is sometimes quite impossible to remount the wood in its original position if more work has to be done. There is no reason at all why quite large bowls cannot be turned on the woodscrew chuck and recently, at an exhibition, I surprised quite a few people, including myself, by turning a mammoth bowl of over two feet in diameter on this type of chuck. Providing your cutting tools are used in the correct manner, you will not have any trouble with this useful attachment. The question of using your cutting tools correctly is a very important aspect of woodturning, if trouble is to be avoided, and in a subsequent chapter I hope to make you quite happy on this point.

I have mentioned a lot about bowls only to show you that faceplates and faceplate chucks are quite a problem and it is difficult to make any hard and fast rule about them. Such a lot depends on the type of work to be undertaken. I shall go into this in greater detail in the chapter on faceplates and bowl turning.

So much then for the essential parts of the lathe, which I hope will help you to understand the lathe more thoroughly.

No doubt you may be able to suggest other features but I hope that by the time you have reached the end of this book, most of your queries will have been answered.

Speeds. One thing which was lacking in the primitive lathe, was a constant source of power and speed, but thanks to the small electric motor, we can quickly overcome both of these problems. The speed at which your lathe must run depends entirely on the diameter and balance of the wood on the lathe. You will understand that if your lathe has one fixed speed, say 2,000 r.p.m., you must exercise great care on the larger diameter work, as any unbalance of the work will cause vibration and probably the wood will fly off the lathe, causing you injury if you should be in the way; but if the wood were only 2 or 3 in. in diameter, all would be well. There are quite a few technical books on wood machining and in them you will find all sorts of equations and formulae, telling you what speed the outside of the wood should travel in feet per minute. This is all very well and interesting, but as most lathes have only three or four speeds at which they can run, then we must have some rule of our own which will help us to choose the most practical speed at our disposal. I have found the following speeds satisfactory, assuming of course, that the piece of wood is true and mounted centrally on the lathe.

Diameter in inches	*r.p.m.*
1–2	3,000
2–4	1,500–2,000
4–6	1,000–1,500
6–8	750–1,000
8–12	450–750

You will see that as the diameter of the work increases so the speed of the lathe must decrease, but if your lathe has not a speed range as shown, do not be disheartened. You just choose a speed which corresponds as near as you

can get to those which I've suggested. It will be possible to turn at higher speeds than I've shown, but there is a great disadvantage in turning too fast, and that is the heating up of the cutting edge of your tools, so you may turn faster, and create a fine shower of shavings, but you will be spending twice as long trying to keep your tools sharp. Owners of lathes driven by electric drills will find the speed of the drill is higher than the speeds I have mentioned, but this is quite all right, as by the design of the machine, there is a restriction on the maximum diameter of work which can be tackled. Some types of drills are now fitted with a two-speed device which makes the tool more flexible.

If the work, when it is placed on the lathe, is unbalanced due to rough cutting out, it will be necessary to turn at a much slower speed until the work has trued up. The amount of vibration set up on your workbench will soon give you the clue that you are turning at too fast a speed. One final point on speed, and that is your choice of electric motor, and here I would suggest one of not less than ½ h.p. and supplying a constant speed of 1,425 r.p.m. This, fitted with a three- or four-step pulley wheel, will supply all the range of speeds for turning anything up to 12 in. in diameter.

Quite often one is offered a choice of electric motors when buying a lathe, either 1,425 r.p.m. or 2,800 r.p.m. Both are quite suitable for lathe work, but if large diameter work is contemplated, e.g. salad bowls, etc., I would prefer to have the slower speed for greater flexibility. The faster motor could be used with a counter shaft to reduce the speed, but I don't like lathes festooned with additional belts and pulleys.

CHAPTER THREE

Simple homemade lathes

WHEN I first started woodturning, my first machine only cost me ten shillings. It was made entirely from parts found in the local scrap-iron yard. Quite a lot of time went into the making up of the various parts which were mounted on a wooden bed but the reward was well worth waiting for. At last I had something with which I could satisfactorily turn pieces of wood into something useful and saleable, and after three or four years, I had saved enough money to buy an up-to-date combination lathe, that is a machine tool with a lathe as its basic form, but with various attachments which could be added for circular sawing, planing, sanding, etc. Now I was really set up in business.

I mention all this because if there is an urge to take up woodturning, or for that matter any other craft, do not wait until you have the money to buy what you think you require. Make it yourself and get started. It's far more interesting and you will soon have more knowledge of what your ultimate requirements in tools and machinery are to be. There are so many lathes on the market now of different shapes and sizes, that the amateur finds it all the more difficult to choose his tool, unless he has learned something about his new-found hobby.

The lathe I am about to describe is quite simple and cheap to make and will give any man or boy plenty of scope to learn his trade and gain confidence in the handling of tools. If you can pick up a secondhand lathe cheaply, of course, this is a very good idea in the apprentice stage, but, I repeat, don't let the financial side stop you learning a trade, craft or hobby.

For the bed of the lathe, we shall require two pieces

4 ft. long of Oregon pine, 2 in. × 6 in., planed on all four sides and mounted on edge 2 in. apart, either supported on trestle legs or mounted on a short stand in a workbench, giving a clearance of three or four inches between the underside of the bench top and the bed (see Fig. 4A).

The headstock should consist of a block of wood 2 in. thick, 10 in. long and 3 in. wide. This is placed in the space

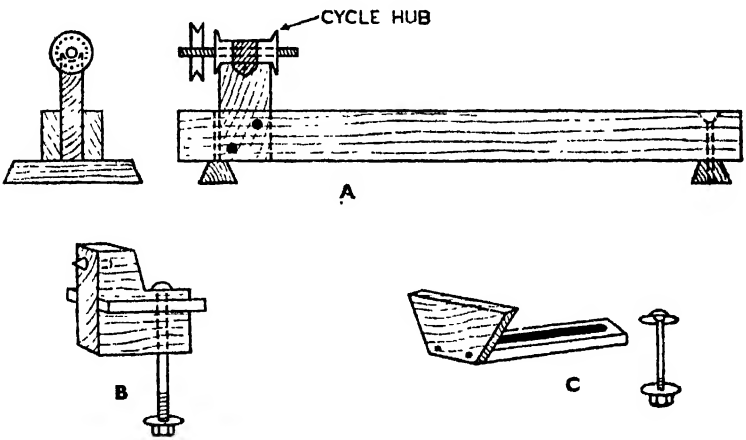


Figure 4. (A) Headstock and bed. (B) Tailstock. (C) Tool rest.

between the bed on the left-hand side and bolted and screwed through so that 4 in. protrude above the bed of the lathe. For the main shaft, all that is needed is the front hub assembly of a bicycle which is clamped down on top of the piece of wood forming the headstock. You may find it easier to assemble, if a shallow V-groove is cut along the top edge of this piece of wood and parallel with it. This will prevent any sideways movement of the bearing assembly. The front of the hub, which would normally anchor the spokes, will prevent end play.

I prefer to use a bicycle hub for two reasons. In the

first place, it has a shaft running in ball bearings which are adjustable, and secondly, the shaft has a thread on it which is the same as that found on three-jaw chucks fitted to some hand drills – all very convenient. Having clamped the hub assembly firmly down, a pulley can be fitted to the left-hand extension of the shaft and a three-jaw chuck on the right-hand shaft extension. Various manufacturers of electric drills, will supply driving centres and faceplates which can be held in the chuck, or again, it is a fairly easy matter to make simple driving centres from filed-down bolts, if you want to cut the cost to a minimum.

Your lathe is now taking shape and has a swing or distance from centres to bed of about $4\frac{1}{2}$ in., so now we must make a tailstock.

For this we need another piece of wood, 2 in. thick and 6 in. square, with a step cut in it as shown in the drawing (see Fig. 4B). Two inches from one end, screw and glue two 6 in. pieces of 1 in. square wood to each side to form guides for the tailstock to slide on. This piece of wood will now be able to slip in between the lathe bed with 4 in. above the bed and 2 in. within the bed. Now cut out a small step 3 in. long by 2 in. deep, drill a $\frac{3}{8}$ in. hole through the block of wood to allow a long bolt to be passed through to underneath the bed. Place on the end of the bolt a large stout washer or round piece of wood about 3 in. in diameter and replace the nut. You now have a tailstock which can be moved along the bed and can be securely clamped in any position.

All that remains is to fix a dead centre to the tailstock at the same height as the centre of the headstock. For a centre, we can either buy one or make one out of a suitable bolt which can be screwed into a slightly undersized hole drilled into the tailstock.

The tool rest is a real simple affair, but will do for our purpose. All that is wanted is a piece of wood 8 in. long, 3 in. wide and 1 in. thick, with a slot cut through it for 6 in. of its length. This can best be done with a fretsaw. This

slot should be about $\frac{1}{2}$ in. wide. At the end of this piece of wood and farthest from the slot, screw and glue, at right angles, a piece of 1 in. thick wood, 6 in. long and 3 in. high, shaped as shown in figure 4C. Place the finished tool rest on the bed and pass a long $\frac{3}{8}$ in. bolt through the gap between the bed and fix to it a large washer and nut. The tool rest is now adjustable in two directions.

You may think this is rather crude but it will be quite strong and durable and will take quite a lot of knocking about. Agreed, there are a lot of refinements we could build into it, but I am sure that by the time you have tried your skill at woodturning, it won't be long before you start to look through various magazines and price lists, but this will help you to find your feet with regard to woodturning and your money will not have been wasted.

I have come across quite a number of people who have the idea that if they go into a shop and spend £50 to £100 on a machine tool it will automatically make them into craftsmen. In lots of cases they have not the slightest idea of the trade they are plunging into and are consequently very disappointed with the tools they have bought.

However, don't let me prevent you buying a lathe at this stage if you want to. There are many to choose from, all very good and with a wide range of sizes and prices.

CHAPTER FOUR

Lathes suitable for amateurs

Price range and adaptability – Advantages of various types

Now that Great Britain is becoming very much Americanized and trade restrictions between the two countries are relaxed, we can see at various exhibitions and stores a real galaxy of machine tools, originating from almost the four corners of the world. To cover all amateur lathes made would be quite an impossible task, and I shall only deal with some of those of British and American origin. They will be within a price range of £5 to £50.

Probably one of the most popular types of lathe is that driven by a small, portable electric drill. Here we have a machine which is entirely portable and quite capable of turning out some very good work. Of course, we must not expect to be able to turn out 10 in. salad bowls or similar large dimension projects, but we can make anything up to 6 in. in diameter and 24 in. between centres. Articles of this size are well within the range of these versatile machines. Several people I know make a very handsome additional income turning stool legs, egg cups, cruets, etc. on this type of lathe. The price range, excluding electric drill, will be between £6 and £10. For your money, you will get faceplate, centres and tool rest. Other accessories, such as boring tools, woodscrew centres, etc., will be extra. The electric drill can be bought for between £7 and £10, and will have a speed of anything from 2,800 r.p.m. to 3,600 r.p.m. This, as I have already mentioned, is quite a suitable speed for the nature of the work undertaken. Most tool shops and hardware stores stock this type of lathe, and demonstrations can usually be arranged.

Some British manufacturers of this type of lathe are Bridges, York Road, Battersea, London, S.W.1: Wolf Electric Tools, Hanger Lane, London, W.5: Black & Decker, Harmondsworth, Middlesex.

One big advantage of this type of tool, is that the power unit, which is the drill, can easily be taken off, and used for other jobs, away from the bench, such as drilling, sanding and polishing, or made to drive small circular saws and other attachments, of which there are many. For the man with limited means, this is quite a good buy.

In all these drill-powered lathes, the work is turned directly by the drill itself, the various centres and chucks being held by the drill. One very interesting drill-powered lathe is that manufactured by Millers Falls Company, Greenfield, Massachusetts, U.S.A. In this unit, we have a normal type of lathe with 30 in. between centres and having mandrel and tailstock bored to take centres having a No. 1 Morse taper shank. The drill is mounted separately on a platform behind and attached to the lathe, the drive being by means of a V-belt and single pulley on the drill to a four-step pulley on the lathe. Variation of speed is obtained by sliding the power unit sideways, on the special platform, to line up the single pulley with whichever one of the four steps of the headstock pulley is desired. For other work, away from the lathe, the drill can be quickly detached, or on the other hand, a normal ½ h.p. electric motor can be fitted and will give the lathe more flexibility and power. Turning speeds obtainable using the electric drill as the power unit, range from 1,400 r.p.m. to 2,500 r.p.m. and with an electric motor from 900 r.p.m. to 3,200 r.p.m.

Above £10 and under £50, we come to the larger more robust lathes, which are driven by a separate electric motor, by means of belt and graded pulley. These, too, can usually be used to perform other jobs besides wood-turning, by the addition of simple attachments. These lathes usually have fully adjustable tailstocks with a self-ejecting

device for easy removal of centres and headstocks, with hollow mandrel for easy removal of driving centres. Large diameter turning can be undertaken on the left-hand side of the mandrel, or as in lathes manufactured by the Coronet Tool Co. of Derby, the whole of the headstock can be rotated so that large turning is done on the right-hand side of the lathe and at right angles to the bed. The motor, being fitted to the headstock, rotates at the same time. This gives a great saving in floor space. Although these lathes are portable, they are really meant to be bolted securely to a bench. Distance between centres is usually 30 in. and distance between centres and bed $3\frac{1}{2}$ in. to $4\frac{1}{2}$ in. This allows for quite a large variety of work to be undertaken.

I have used a lathe of this type for many years and have been most satisfied, whether turning such articles as small drawer knobs or large refectory table legs. A distance between centres of 30 in., enables table legs to be easily turned or tall floor standards, which are made up of two 30 in. lengths of timber. Another feature is the way the centres are held. These are made with a No. 1 or No. 2 Morse taper, which is a standard lathe fitment and are just a push fit in the mandrel or tailstock, which allows for the easy removal I have already mentioned.

The bed of such lathes may be of various section, some round, some flat, but whatever shape, it is essential that it is strong and rigid, with no tendency to distort when in use. I have a preference for the round type of bed, as it is easy to keep clean and there are no ways or grooves to become blocked up, but that does not mean to say that other types are no good. It is just a matter of personal preference.

For this type of lathe, I would recommend an electric motor giving approximately 1,425 r.p.m. and not under $\frac{1}{2}$ h.p. This motor, fitted with a three- or four-step pulley, will give all the speed range you require and will enable anything up to 12 in. or more to be turned. If you have less power than this, you will find that when turning large bowls,

it is quite an easy matter to stop the lathe and this can be quite annoying. Furthermore, it is very difficult to cut the wood cleanly if the lathe slows down as soon as you touch the work with your gouge or chisel. On the other hand, if you have too much power, then most of the time you are just wasting it, so you might as well save your money.

Some manufacturers of lathes between £10 and £50 are Coronet Tool Co., Derby: Myford Engineering Co., Beeston, Notts: Rockwell Manufacturing Co., Pittsburgh, Pennsylvania, U.S.A.

Now that you have some idea of the price of various lathes and their characteristics, please do not have a sudden rush of blood and hot foot it to the nearest tool shop and place your order. Weigh up the advantages and disadvantages of the different types and decide how best they will fit your needs. I should always recommend, if possible, that you visit an exhibition where these various tools are being demonstrated. Lots of valuable information can be obtained by watching other craftsmen at work. Whilst dealing with buying your lathe, please do not be like one person I know of. He saw a turner working at some exhibition or other and thought that he would also like to take up woodturning, so at the first opportunity, he ordered a complete woodworking machine, a combination lathe costing about £200 in all. The whole of this lovely machine was duly set up in a workshop and a host of assorted tools and attachments arranged along the wall. A truly magnificent set up. Alas, when this certain gentleman switched on the machine, he was scared stiff to use it. In fact, he had never handled a tool of any sort in his life before. It had all looked so simple and easy when he had watched an expert at work. Today this machine is packed away in several boxes, having never been used. You may wonder why I tell you this. I just hope it will show that even if you do have the money to buy an expensive machine, you must make sure you have some knowledge of the tools and

machinery. It is just as important that you have a definite interest in the craft, or otherwise you will be bitterly disappointed. It is much better to start a hobby in a more modest way and also much more rewarding.

Many of the lathes manufactured today are actually combination tools where turning is only one of the many operations which can be performed. There is a lot to be said for this kind of equipment where space is a deciding factor, but beware of some types of tool where you spend more time changing from one attachment to another than actually performing the job in hand. Many articles turned on the lathe depend on other operations, such as drilling, sanding or sawing before the job can be completed, and to have one tool in your workshop which will perform all of these operations, is certainly a big advantage. I can well remember when I was using my first homemade lathe, it used to take me longer to prepare the wood than to do the actual turning. Take it from me, it was not long before I had a very crude circular saw working as well.

CHAPTER FIVE

Setting up the workshop

Position and height of lathes for satisfactory working – Natural and artificial lighting – Power requirements

I WONDER how many times you have picked up some magazine or other and seen on the cover, in glorious Technicolor, a young husband merrily working away with a small machine, in their newly furnished kitchen. Possibly he is turning legs for a stool, bits of which are lying on the floor. Standing near by is his wife, all proud smiles.

Well, it may be just like that, but I am sure that my wife would be far from smiles if I used the kitchen for turning.

Woodturning is a fascinating hobby, but I would not go as far as to recommend the kitchen for the operation, if you wish to keep your home life peaceful. I know of no other woodcraft which makes such a mess so quickly, with chips and shavings in all directions.

Setting up a workshop usually takes a long time and it is not easy to plan beforehand to suit everybody's needs and circumstances. All I can hope to do, is to pass on the knowledge I have acquired from messing about for some years. I believe it is every handyman's ambition to have a workshop of his own some day, so here goes.

I am going to assume you have decided to buy one of the larger types of lathes of approximately 48 in. overall length, to take up turning quite seriously. With this type of lathe, we shall probably have floor standard lamps in mind and these have to have a hole bored through their entire length, using a 24 in. auger, which will be passed through the tail-stock or similar attachment. To use the auger, we shall

require nearly 2 ft. for elbow room. Coming to the other end of the lathe, the headstock end, we shall also probably want to do some bowl turning, so again we want another 2 ft. for elbow room. All these distances added together will give you the actual length of working space required, which is about 10 ft. If you are going to use a smaller lathe, such as a drill-powered one, then the length of workshop space will be about 6 ft., but whatever you use allow for long hole boring and elbow room on the right of the lathe.

Woodturning can be quite well carried on in a narrow passage, as it is really the length of the workshop which matters. A very nice shed for turning would be one about 10 ft. long by 6 ft. to 8 ft. wide, with a 2 ft. wide bench running the whole length of one of the longest sides. Make this bench as strong as possible, preferably with $1\frac{1}{2}$ in. thick boards to form the top. You may think this is rather extravagant, having a bench of this length, but until you have actually done some turning, it is difficult to realize just how many bits and pieces you get around you. Fix the bench firmly to the walls and floor, so that it is perfectly rigid, and any vibration in turning operations (and believe me, you will get plenty), will not shake the whole bench and fitments to pieces.

The height of the bench cannot definitely be laid down, as this depends on the height of the lathe itself, and on the height of the person using it. However, the combined height of bench and lathe should be arranged so that the headstock is level with your elbow. If the bench is too low, you can soon develop mysterious pains in your back, which will make turning a real misery. Bearing in mind that you may stand for a considerable time at the bench, a nice comfortable working position is to be aimed at.

We cannot always choose the exact position for a shed to be built, but we must have plenty of light. I prefer to have a window in front of the lathe facing away from the sun,

if possible. A northern facing window is ideal. You may think that this is all wrong, but working with the sun streaming into your face in the summer is most unpleasant, and, furthermore, it plays havoc with any partly turned articles which may be lying on the bench.

In front of you and just below the window, arrange some simple clips, or nails will do, to hold your various turning tools, and above the window, put a nice long shelf to keep your different turning attachments, such as faceplates, drills and chucks. To your right and left above the bench, have more shelves on which to keep partly turned articles, screws and miscellaneous odds and ends. Underneath the bench, it is a good idea to have still more shelves on which to keep your wood of various types and sizes, all together.

You are probably wondering by now, what about the wall behind you, when you are standing at the bench. Now although you have probably seen magazine pictures with this wall covered with bits and pieces, on many shelves, it is not such a good idea, because when you are merrily turning away, all the chips and shavings you make, will shower behind you and any shelves that are there will soon be under a good thick layer of dust and chips. This is one of the reasons why I do not think the kitchen is such a good place for woodturning'

This gives you some idea of a satisfactory workshop set up for turning. Of course, it may be possible to improve on it, but after some years of turning and rearranging my own workshop, this is the pattern I have found to be most practical. You may fancy a larger workshop, but where turning is done, it is a case of the bigger the shed, the bigger the mess.

At this point, it is interesting to take note of one very important finding of the time and motion study experts. That is, for maximum efficiency, a machine operator, dentist or any other person, in any occupation, engaged in working in a confined space, must have everything arranged

around him so that he is able to work in a 5 ft. cube. If this is done, then everything he requires is ready at his finger tips and what is stranger still, most things get put back in their proper places without even thinking about it. Try this yourself when setting up your workshop and see how it works. Better still, try it on your wife in the kitchen. It will save her feet no end!

Artificial lighting will, of course, be needed, and although a fluorescent tube is very nice for general lighting, I much prefer two separate lights, above and at either end of the lathe. One big disadvantage of having a fluorescent tube over the lathe, is that it does not cast any shadows and in turning, you will find that shadows cast on the work, will help you to see any rough spots quite easily. Hence my preference for normal lighting with metal shades.

The lathe motor switch is best fitted just under the bench, below the headstock. Here, it will be fairly free of the dust and chips which must be kept out of the switch. It should be of the PUSH ON/PUSH OFF type, with an overload trip device which disconnects the mains supply, should the motor be accidentally stopped or overloaded. The ½ h.p. motor will consume 6–8 amps when started and 3–4 amps when running. This means that a normal 13 amp power point can be used with complete safety. Tumbler switches are not advised for starting the lathe, as these do get particles of wood in the working parts and cause sparking. You will find it advantageous to have a double-throw fused switch on your power supply to the workshop, so that if accidents do happen, the whole electric appliance in the shed can be isolated, thus preventing the whole household from being plunged into darkness.

If your lathe is driven by an electric drill, a separate motor switch is not required, as this is incorporated in the drill itself. All that will be necessary is a three-pin switch plug mounted in a fairly dust free position.

One final point about your workshop is heating. This is a

must, because to obtain satisfactory results when polishing, a reasonable room temperature is required. French polish and cellulose do very queer things if the room is cold or damp, as I have found to my cost. I will go into the peculiarities of finishing in a later chapter.

CHAPTER SIX

Tools

Types and sizes of gouges; How to use the gouge – Chisels; types and sizes: how to use the chisel – Parting tool and its uses – Scraping tools; why and how they are used; Simple scraping tool the amateur can make – Special and unusual tools – Grinding and shaping tools – Minimum tools required

ON the market today there are many types of turning tools, but please do not be in too much of a hurry to buy the very first ones you see. Some of them are exceptionally good, but some are quite useless for the job for which they are intended. You will see very imposing boxes of turning tools offered for sale, but, I am sorry to say that quite often this is only a manufacturer's way of getting rid of some of the tools for which he has little sale. I must hasten to add, of course, that this is not the case with reputable manufacturers.

Speaking for myself, I prefer to have a small basic kit of tools and add to it as the need for others arises. On my workbench, I have a whole regiment of turning chisels and gouges, but I only ever use three or four of these.

Gouges. The most generally used tool in turning is, no doubt, the gouge which is used for roughing out and also for intricate detail. Gouges can be obtained in various sizes, ranging from ¼ in. to 2 in. wide, some of shallow section and others deep, as you will see from figure 5. For shaping and hollowing out bowls I nearly always use a gouge called a 'long and strong', which is of fairly deep section and made with quite a long and heavy blade. This is most essential, as there is quite some distance between the tool rest and the part of the bowl being turned, and this exerts considerable leverage

on the tool. Good turning tools are made of cast steel and the cheaper tools which look as if they have been pressed out of a sheet of steel, should be avoided.

When buying cutting tools, always choose the best. They

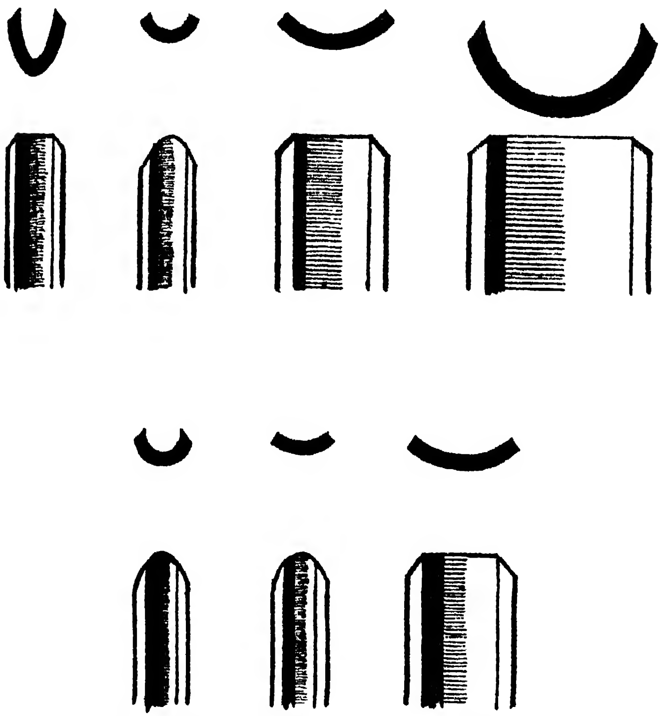


Figure 5. Typical gouge sections.

keep their edges keener and longer. For the amateur, I would suggest three sizes of gouges only for a start, i.e. $\frac{3}{8}$ in., $\frac{3}{4}$ in. and $1\frac{1}{2}$ in. The larger one is a most useful one for roughly rounding a piece of wood, while with the $\frac{3}{8}$ in. gouge, practically all other detail work can be done. For bowl turning, you will find this size is a good maid of all work.

As I have already told you, I have quite a number of turning gouges, but my favourite weapons are a good old $2\frac{1}{2}$ in. gouge, which I use for roughing out. It is quite spectacular in use, as it really butchers the wood. My other favourite, is a shallow $\frac{3}{8}$ in. gouge. These I usually buy two at a time and use them for practically all turning operations. The in-between sizes I only use when the others need sharpening and I cannot find my sharpening stone!

Now I think it time to show you how to cut the wood with a gouge and how to avoid getting into trouble. Many times people have come up to me when I have been demonstrating and have told me that I make it look so easy. Turning is not too difficult if you go about it in the right way and you fully understand what you are doing.

Beginners in turning often have small mishaps while they are learning, such as the tool digging in and being forced out of their hands. This usually frightens them and they quite often pack up the whole idea, instead of giving it a fair trial and persevering and trying to understand what went wrong.

Let us look at a cylinder of wood, with the grain running from end to end as in figure 6A. Now, if we were going to cut it with a knife or chisel, we should make the cut in the direction V to W, as this is cutting with the grain. On the other hand, if we were to try to cut from W to V, there would be every chance of the wood splitting and the knife or chisel not going where we intended it to go. Coming back to turning, if this same block of wood was on your lathe, and you wish to cut a V-shaped groove, the same principle must apply, and as far as possible, always cut with the grain. Commencing at point X, cut alternately from direction V to W, and Y to W. On no account cut in the opposite direction to the arrows. If you do not believe this, just you try it and see where your gouge goes, but do not say I didn't warn you.

Whatever the nature of the work on your lathe, always

try and visualize the direction of the grain of the wood. Have a good look at it before you switch on the lathe and mentally note if there are any peculiarities in the grain and when you commence to turn always cut with the grain. You will have already noticed from figure 6C that you cut from

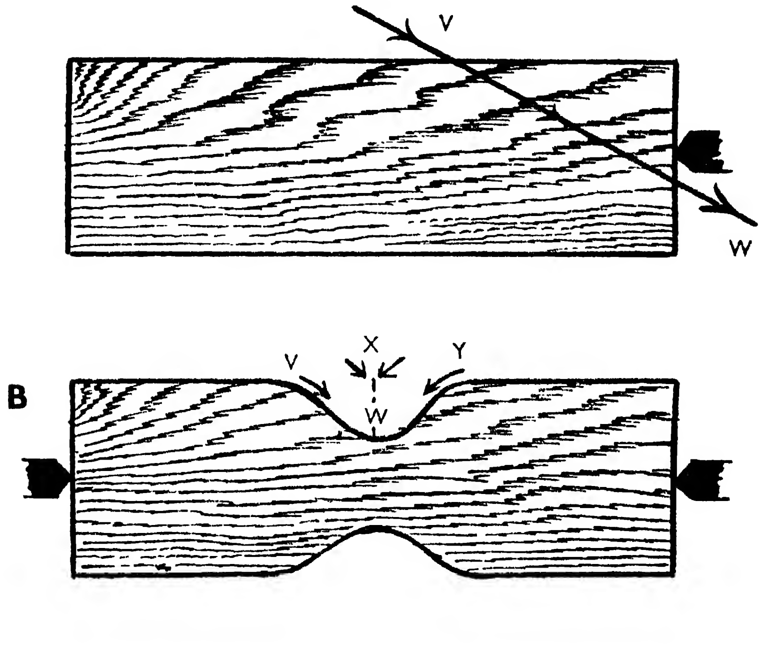


Figure 6. Stages in turning table leg showing positions of gouge while shaping.

the larger diameter to the smaller. Never, I repeat, never, from the smaller diameter to the larger. You will understand now, how the wood should be cut, so take a piece of wood about 3 in. across, which has previously been roughly rounded with chisel or plane and mount between centres. Screw up the tailstock, so that the wood is held securely on to the prong driving centre and lock the tailstock. Set the speed of your lathe, by selecting the appropriate pulley size so that the work will revolve at about 2,000 r.p.m. Bring up the tool rest so that it is at a height just above the centre line of the work and as close to the work as possible without touching it whilst it is rotating.

Now comes the question of how to hold the tools and position the hands. In handling all tools, the handle hand will take up a more or less natural position, depending upon the amount of leverage required to manipulate the chisel or gouge. The other hand will naturally be holding the blade of the tool and it is more or less a matter of individual preference rather than making a hard and fast rule on any definite position. Using a gouge, I prefer a palm up grip with the fingers close to the tool rest, the first finger being used as a guide and the thumb pushing or guiding the tool. This is a more delicate method of holding the tool and less tiring than the clenched fist or palm down method. In this position the whole of the blade is gripped and the little finger used as a guide along the tool rest. If the work is very uneven, such as at the commencement of turning, then the latter grip may be more suitable to some, especially beginners as there is a better grip of the tool in the event of accident.

Using a $\frac{3}{4}$ in. gouge, and holding it level, gently push the tool into the work and note what happens. You will see that you make a groove and small chips of wood come away from the tool and that the cut is rather rough. Now gradually slide the gouge along the tool rest, keeping it at the same angle to the work and you will notice that the piece of

wood is gradually becoming a cylinder. Repeat this until the whole piece of wood is the same diameter throughout. Stop the lathe now and have a look at your handiwork. You will notice, that although it is round, it is rather rough, but do not be downhearted. Start up the lathe again and this time, slightly tilt the gouge, with the handle down a little and the bevel of the tool rubbing on the work. Move the tool along the rest in the direction of the tilt and again note what happens. This time, instead of chips of wood, you will notice that you are getting shavings to come away. This is what we are aiming at always, shavings instead of chips.

Whatever the nature of the work, always try to cut the wood so that the waste wood comes away in nice curly shavings. This will save a lot of time and will make for less sand papering of the finished article.

Now put down your $\frac{3}{4}$ in. gouge and select a $\frac{3}{8}$ in. one, of not too deep a section. This time I want you to round off the end of the piece of wood, so with the gouge on its right side and at an angle to the tool rest, by pulling the handle towards you, take a cut at the right-hand end of the work. Again shavings will come away and the cut will be quite smooth. Repeat this several times, until you have the feel of the tool and confidence in the way you are working. Do not be in too much of a hurry to make a finished article. It is much better to master the use of the tool. Spend some considerable time just playing about. It is well worth it.

Take the same $\frac{3}{8}$ in. gouge and this time shape the left-hand end of the wood. That is, with the gouge on its left side and the handle a little way away from you on your right side.

It will be evident by now that there are only a few basic principles in using the gouge. Firstly, the tool may be advanced along the work from right to left or vice versa. From headstock to tailstock is preferable, as this will throw the waste material away from the operator. The gouge is rolled over slightly in the direction in which it is advancing,

with the bevel rubbing the work making a clean slicing cut. You will have already noticed that when pushed straight into the work, the gouge has a scraping action. This is not true woodturning.

Chisels. It is generally accepted that the skew chisel is the most difficult of the turning tools to handle, and can

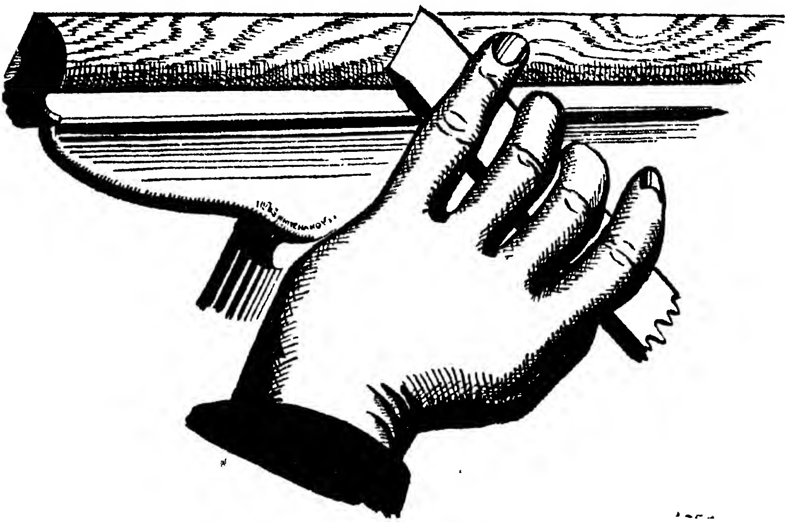


Figure 7. Skew chisel in use, palm downwards.

be the reason why a lot of beginners give up turning entirely. I must admit that it is not a favourite tool of mine at all, however, if you are going to be a successful wood-turner, the chisel must be mastered. To get the feel of the tool, your best plan is to smooth an ordinary cylinder of wood, which has been previously roughly turned to shape with the gouge. The chisel should be held in a similar manner to the other turning tools, but must be supported by the tool rest at all times. Quite often beginners overlook this point, whilst trying to execute some detail in design, with unfortunate results. The chisel will be easier to handle if the tool rest is slightly higher than it is for other turning. Now

place the chisel well over the work and flat against it. Gradually pull the tool towards you into such a position that it will begin to cut the wood. A firm grip on the chisel is important. If the handle is raised, you will notice that the chisel takes a deeper cut. Similarly, if the handle is lowered, the tool will cut less. It may be advanced in either direction, much in the same way as with the gouge, but

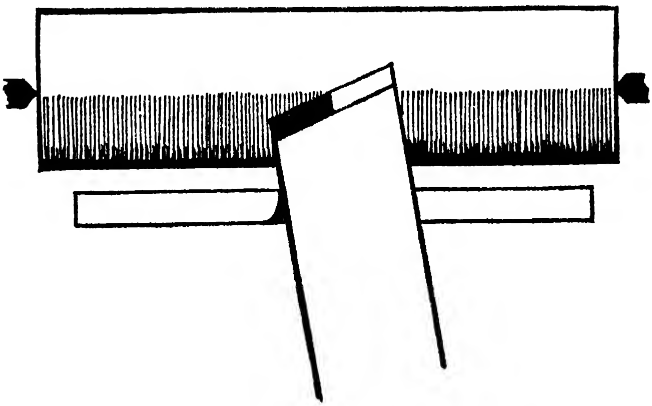


Figure 8. Skew chisel showing only half of cutting edge in use.

remember to keep it firmly on the tool rest, using this as your guide while advancing the tool to the left or right. It is interesting to note, that although our chisel is quite wide, we only use half of the cutting edge, that is, the portion between the heel and the centre. If you should try to use the other half of the tool, be prepared to have a nice chunk taken out of your work. It is surprising how easily the point of the skew chisel will dig in if these points are not observed.

If you can imagine the cutting action of the chisel in slow motion, you will notice that the bevel does all the work very much in the same manner as the cabinet makers' smoothing plane and it is most important that the bevel be kept really flat and long so that your actual cutting edge is an angle of between 20 and 30 degrees.

The shavings coming away from your work, will soon tell you whether the chisel is cutting correctly and if the bevel is ground to the correct angle. The shavings should come away quite cleanly in a continuous stream and not as if they have been scraped off. The width of cut can be altered by changing the angle at which the tool is held. The widest cut will be when the cutting edge is nearly parallel with the work and when the cut is at an angle to the work the shavings will be much narrower.

Having smoothed your cylinder of wood, and by now you should have some idea of how to do it, let us practise turning beads, but not the ones you wear around your neck. For this project, a ¼ in. or ½ in. skew chisel will be required with an even bevel on both sides. The cut is started with the cutting edge on top of the revolving wood, with the handle well down. The heel of the chisel is then brought into contact with the wood and the cut begins. At the same time the handle is twisted and lifted. This will form one side of the bead. Turn over your chisel and repeat for the other side of the bead. Twist the handle in the direction of the cut, that is for the left-hand side of the bead you twist the handle anti-clockwise and for the right-hand side, clockwise.

In turning a cylinder, we have the chisel held flat on the tool rest, but if we wish to turn a straight taper or convex shape, the cutting operation is very similar, except that the cut is started with the heel of the skew chisel, to prevent the tool digging into the work, and also to form a bevel for the chisel to ride on whilst continuing the cut, which must be from the larger diameter to the smaller, or downhill. It will be found necessary to slightly twist the blade of the chisel and this is done by means of the thumb and fingers of the hand holding the blade, using the tool rest as a guide and support. As the cut continues, the angle of attack can be altered so that a wider cut is taken, but do not go beyond the halfway mark of the cutting edge from the heel end, or you will have the point of the chisel giving you trouble.

Tapered cuts can be made a little easier if the work is previously roughed to shape with the gouge.

When using the chisel for smoothing, you will find that the wider ones are easier to handle, as only half of the cutting edge is used and furthermore, the extra weight is helpful.

I have heard of a carpenters' hand plane being used to smooth a cylinder of wood, whilst it is rotating in the lathe. Other people use a wood rasp in an endeavour to smooth the wood. Presumably this works, but again I say, this is not woodturning.

Parting tool. The parting tool is, perhaps, the easiest of the turning tools to master, as it only requires to be pushed into the work, in a scraping action, as shown in figures 9A and B. If a cutting action is preferred, it is obtained by holding the handle low with the cutting edge touching the work, raising the handle as the diameter of the work decreases. For marking the various positions of beads and hollows, the parting tool has many uses. It can also be used as a small chisel for shaping beads, if the proper tool is not to hand. It will be noticed, that with a well-shaped parting tool, the cutting edge is slightly wider than the rest of the blade. This is to give clearance when deep grooves are being cut. In practice, you will find turners using the tool single-handed and the other hand holding a pair of calipers. Do not try fancy tricks until you know what you are doing. Parting tools usually have a cutting blade $\frac{3}{16}$ in. or $\frac{1}{4}$ in. wide. Any wider than this and they are not too easy to use.

Scraping tools. Practically all turning operations should be done with cutting tools such as chisels and gouges, as these give a far superior finish. After all, the smoother we can cut the wood, the less sand papering is required and the easier the polishing. However, there are times when a scraping action has to be used. Some woods, having very curly grain, can only be scraped to shape. Also very small items are more easily fashioned in this way. The inside of a

bowl, for instance, has to be partly scraped before finishing, as the gouge cannot be used, owing to its corners digging in. Articles turned in ivory or rosewood have to be scraped. Scraping tools can be bought, but the best are made from old worn out files ground to shape and bevelled. Definite shapes cannot be laid down but figure 10 shows some of the

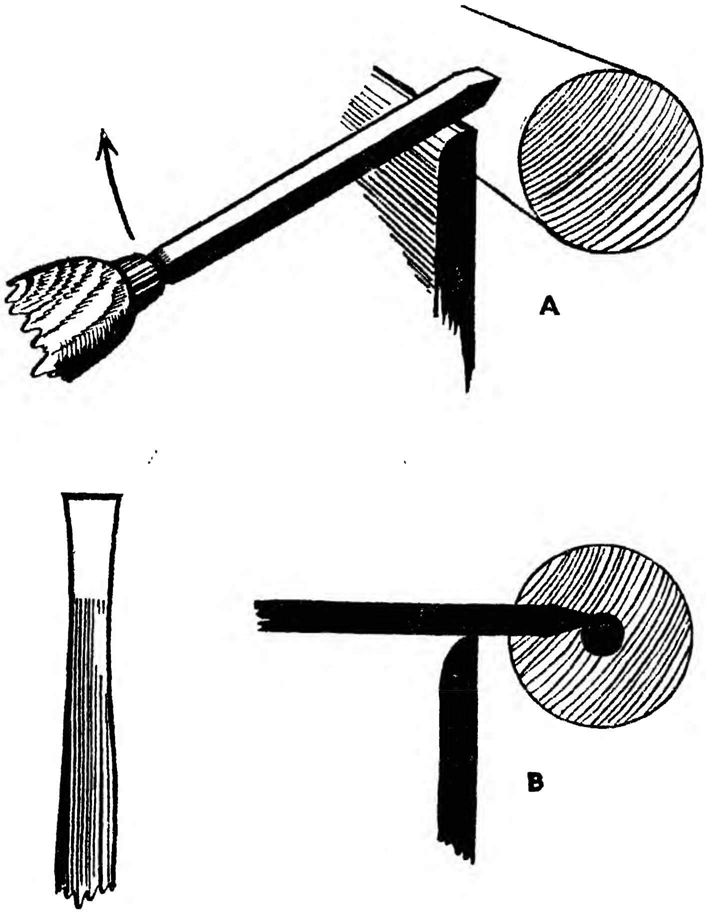


Figure 9. Cutting action of parting tool.

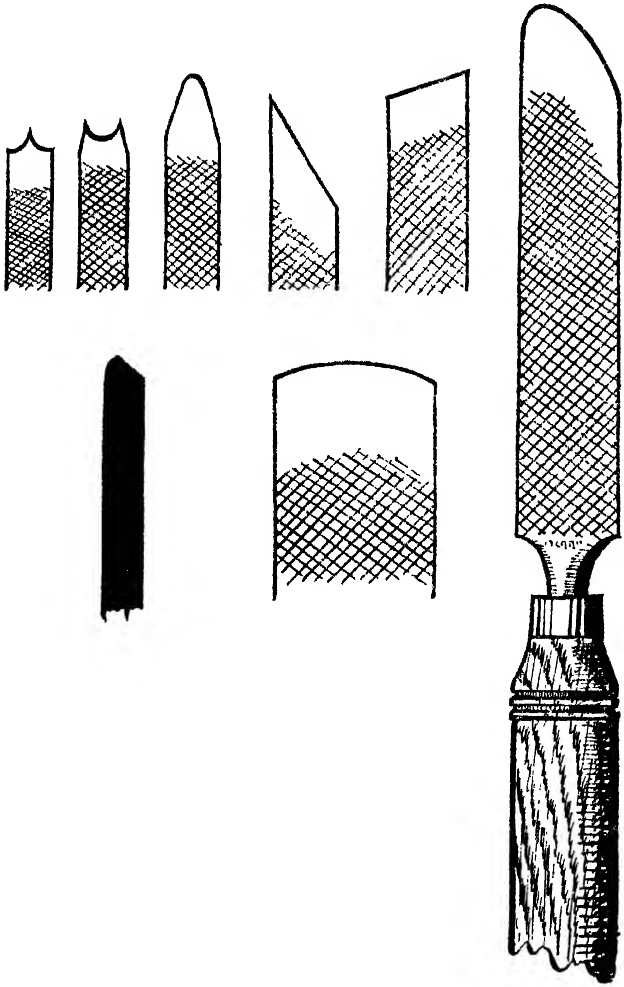


Figure 10. (A) Scraping tools from old files.

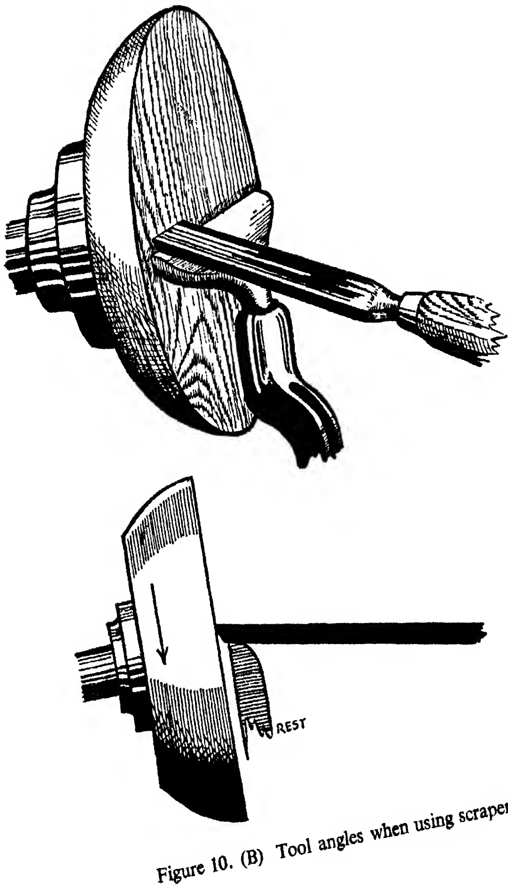


Figure 10. (B) Tool angles when using scrapers.

most useful ones. When grinding a file to shape, beware of getting the tool too hot and spoiling the temper of the metal. The end of the tool should be ground to the desired contour and given a bevel of approximately 60 degrees.

Special and unusual tools. Quite a number of turning operations can be simplified by one or two homemade tools. For instance, where a number of pieces of wood have to be turned with a parallel pin at one end to a definite

Figure 11. Tool for cutting small tenons or dowel ends.

size. This can be done with a parting tool and a pair of calipers set to the finished size. A much simpler way, is to mount a piece of thick, mild steel about 1½ in. wide at one end and tapered to fit into a wooden handle. In the wide end of the metal a deep U is cut to the width of the pin required. The work is roughly turned to shape and size with normal turning tools, then this special tool is rested on the tool rest and pushed into the work and will scrape the pin to the size of the U cut. Several of these tools should be made up of various sizes, ranging from ½ in. to 1 in. They will cater for most sizes of pin.

Sometimes one is called upon to cut a thread on a wooden spindle. The usual method is by means of a hand-screw box, but it can be done with a tool called a hand chaser or thread chaser. Chasing tools should be made of good quality tool steel of about ¼ in. thick with teeth well spaced at 8 to 10 to the inch. Two types are made for internal or external work as shown in figure 12A and B. To use this tool, the work is turned at the slowest speed and the tool lightly pushed into the wood and moved along the tool rest at

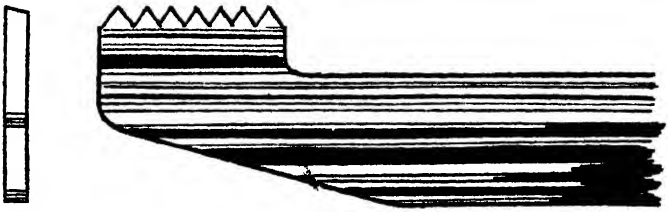


Figure 12. (A) Thread chaser, internal type.

a uniform speed. A light cut is made first to start the thread, but more pressure is applied as the thread takes shape, and will, more or less, cut itself once started. Thread chasing is not very successful in soft woods and should be used only on hard, close grained woods. In use, the tool should be applied to the work with the handle held well up, so that it is at right angles to the revolving work, then there will be no fear of the tool digging in.

Another useful tool is one with a blade similar to a long chisel but with detachable cutting edges. Various cutters can be made of tool steel to different shapes. This is very

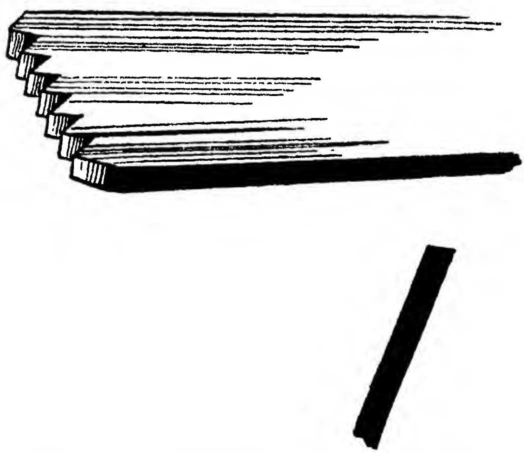


Figure 12. (B) Thread chaser, outside type.

useful, where repetition work of small parts is required, such as in the manufacture of beads, etc. On the other hand, tungsten steel cutters could be fitted if you do not wish to be continually sharpening your tools.

Lastly, an old hacksaw blade mounted in a wooden handle has its uses. Very often, on small turned work such as novelties found in gift shops, a decorative black band is required to finish it off. With the lathe turning at high speed, press the back of the hacksaw blade into the revolving work and you will quickly have a lovely black ring, due to friction heat between wood and metal.

Grinding. To be a successful turner, you must always keep your tools sharp and in good shape, and to do this a good grinding wheel, preferably one which is electrically driven, is well worth buying. With most amateur lathes it is possible to obtain a grinding wheel attachment. Grinding tool steel is an art in itself and a whole book could be devoted entirely to this subject. However, we are chiefly concerned with only keeping our chisels and gouges in good condition. There are numerous sizes and grades of grinding wheels, but for our use, one of medium texture will suffice, preferably 6 in. in diameter and $\frac{5}{8}$ in. wide. Most turning tools, when bought, will not necessarily have a bevel which suits the particular individual. Some prefer a long bevel, others a short, but one thing must be remembered and that is, the longer the bevel, the more delicate the cutting edge. Gouges used for hollowing out bowls, have a very short bevel, which will give a cutting angle of about 45 degrees, whereas those used in spindle turning, that is between centres, have a bevel of about 30 degrees. Grinding should be carried out on the edge of the wheel, care being exercised to maintain the required bevel, and not to damage the cutting edge. Always have a jar of water by your side when grinding, so that if there is any evidence of your tool beginning to turn blue and overheat, it can be easily quenched.

I have seen quite a number of people, including myself

at times, grind their tools on the side of the wheel. This is a very dangerous practice, as it can weaken the stone and cause it to fly apart whilst rotating at speed and cause considerable injury to the operator.

Chisels are ground with a fairly long bevel, to prevent the tool digging in when in use. A short bevelled chisel is very difficult to handle, as the cutting angle is too acute, thus making it more likely to dig in if not handled with care.

Having ground your tools to shape and put a rough edge on them, you must now give them a good cutting edge by means of an oilstone. The best oilstones are those made of ARKANSAS or WASHITA stone, but for some, the price is a little too high, but whatever you choose, have one of a fine grade. Your oilstone should be 8 in. × 2 in. × 1 in., you will also need a slipstone 4 in. to 5 in. long, tapered from $\frac{3}{8}$ in. to $\frac{1}{8}$ in.

A carpenter sharpens his chisels and gouges by placing the stone on the bench and taking the tools to the stone. In woodturning, of course, we have to be different and take the stone to the tools! When stoning a gouge, I hold the tool in my left hand, with the handle tucked under my left arm, and the stone in my right hand, being very careful to keep the bevel of the tool in contact with the stone which is used with a circular motion.

Having stoned the bevel of the gouge, a false edge, or burr, is formed which will have to be removed. This is where the slipstone comes into use and is rubbed on the inside of the gouge. The slipstone, being tapered, will fit the curvature of various sizes of gouges. Most people develop their own particular way when sharpening tools and it is best left to the individual to form his own idea. Some prefer to rest the tool on a part of the lathe whilst it is sharpened, others hold it steady into the side of the body. A good way to remove the burr on the cutting edge, is to jab the tool into the bench or a handy piece of wood. Figure 5 shows some of the various shapes of gouges after grinding.

All have their uses, square ground is for roughing out, round shaped being used for shaping between centres.

Sharpening a chisel, I usually rest the blade on some convenient part of the lathe or bench and rub the stone along the bevel, again being very careful to maintain the original cutting angle. To be really effective, chisels must be kept really sharp.

Scraping tools come in for less careful treatment, and are not usually oilstoned at all. To get scraping tools to work well, we take great care to put a burr on the tool. The usual way to do this, is to grind the end to shape and remove the burr on the grindstone. Then with a piece of hard steel rod, called a ticketer, turn the edge of the scraper very much in the same way as the cabinet maker does with a hand scraper. If you need the scraper for soft woods, you can dispense with the ticketer and use the tool as it comes off the grindstone, with a good rough edge. Again, this is a case of practice makes perfect, and you will soon find the best edge to suit your own particular work and materials.

I suggested earlier, that you should not rush to buy a complete kit of tools for woodturning. Well, perhaps by now you have some idea of the type of tools you require and I would suggest the following as a good basic kit.

Gouges. $\frac{1}{4}$ in. 'long and strong', $\frac{3}{8}$ in. deep 'long and strong', $\frac{3}{8}$ in. half round, $\frac{5}{8}$ in. half round, $\frac{3}{4}$ in. half round, $1\frac{1}{2}$ in. half round.

Chisels. $\frac{1}{4}$ in. square, $\frac{1}{4}$ in. skew, $\frac{1}{2}$ in. skew, 1 in. skew, 2 in. square.

Parting tool. $\frac{1}{4}$ in.

Scrapers, half round, about $1\frac{1}{4}$ in., square about $1\frac{1}{4}$ in. The scrapers will best be made to the turner's own requirements, as there are very few of them on the market. Remember to keep all your old files for making these.

When I first started turning, I bought only one $\frac{3}{4}$ in. gouge, complete with handle, and with that one tool made

several tool handles. This is a good exercise for anybody to start with. Having made half a dozen handles, not expertly, I can assure you, I felt that they would suffice and I bought the blades only of other gouges and chisels. Some manufacturers market the blades only and this can cut your initial outlay considerably.

After a little woodturning, you will have quite a layer of wood chips and dust all over the place. Do not clean it all away, as a layer of wood dust on the tools and lathe appears to keep the rust away, so do not keep the workshop too spick and span.

CHAPTER SEVEN

Working between centres

Roughing out – Making a table lamp – Use of gouge – Making a stool leg, showing use of chisel and gouge – Long work between centres, showing use of steadies – Repetition work – Templates.

I THINK the easiest way to learn turning is to make something definite, although your first attempt may not be too successful. At least you can learn by your mistakes. Table lamps are my favourite articles as they can be turned and finished without removing them from the lathe, and there is, also, something useful and saleable. A very important factor.

Using a four prong centre in the mandrel, mount a block of wood 6 in. long and 4 in. square between centres. The corners can have been pieviously removed with a chisel or saw, but it is possible to do this on the lathe, if care is exercised. Set up your lathe by altering the driving pulley to give a turning speed of about 1,000 r.p.m. Tighten the tailstock so that the wood is held firmly between centres—not too tight or you will damage the bearings. Adjust the position of the tool rest so that it is as close to the work as possible and at a height of about a quarter above the centre line of the work. Now start up the lathe. If there is any vibration, this is because the wood is out of balance but it will soon disappear when it is trued up by the roughing out operation. Taking the ¾ in. half round gouge, hold the handle firmly in the right hand towards your right side. With your left hand, palm upwards and index finger against the tool rest, grasp the blade of the gouge between thumb and fingers. This should give you a good hold of the tool. The

fingers, besides holding the tool, will act as a guide against the tool rest. Slightly turning the handle hand to the right, commence to push the tool into the wood at a point about 2 in. from the tailstock end of the work and at an angle to the tool rest. Continue in stages working from left to right until a point is reached about 2 in. from the live centre, where the gouge is rolled over on to its left side to carry the final cut off the live centre end of the work. This roughing out procedure is carried out by taking a number of bites at the work and not in one long, continuous stroke. Your piece of wood should be a more or less true cylinder by now, although probably a little rough. To smooth it down a little, just run the gouge on its side from end to end of the work, holding the tool as has already been described.

The best way to smooth the wood down is by using the chisel, but as this is about the most awkward tool with which to commence turning, we will leave this till later. All I want to do at the moment, is to get you used to the lathe and just a few of the easier-to-handle tools.

The next stage in our first masterpiece is to true the ends of the block with the parting tool. As the wood has been more or less trued up and is pretty well balanced, you can now increase the speed of your lathe to about 2,000 r.p.m. The parting tool can be held in a similar manner to the gouge, but again, I prefer the palm up method. It must be remembered in turning that no brute force is required. It can, in fact, be done single-handed, as some operations call for, and if your tools are sharp and you understand what you are doing, only a very light touch is necessary. Forgive me if I repeat myself from time to time, but to get some of the important points home, it just has to be done.

With the handle hand down and the parting tool resting on top of the work, gradually lift up the handle and commence the cut, continuing until a point is reached close to the centre. Alternatively, the tool can just be pushed straight

into the wood and it will scrape its way to the centre of the work. Make sure the point of the tool does not wander, as the left-hand side of the work will eventually be the base of the table lamp. We don't want our first project to rock or to fall off the table.

The next stage is the final shaping of the block to some pleasing shape. This is the whole joy of woodturning, as before your very eyes, a comparatively useless piece of wood is quickly transformed into a thing of usefulness and beauty. Take the $\frac{3}{8}$ in. half round gouge holding it as with the other tools. Turn it on its right side and commence to cut away the right-hand end of the cylinder, pointing the tool in the direction of the cut, with the bevel rubbing the work. Continue with separate sweeps of the gouge until the desired shape is reached, as in figure 13. This will be the top of the table lamp. The next stage is to shape the stem. Holding the $\frac{3}{8}$ in. gouge as before, cut a small V-groove about 2 in. from the headstock end and continue to enlarge this, taking alternate cuts first on one side of the V and then on the other, thus shaping it to the required design. On no account cut down one side of the V and back up the other. This will really get you into trouble. Always cut from the larger diameter to the smaller, no matter how small the detail you are shaping. If you are using the gouge correctly, you should be getting nice curly shavings coming away from your tool. If you are not, try tilting the gouge a little more in the direction of the cut. Continue cutting at this point until you have produced a nice curved neck. To shape the two little steps or coves, just turn the gouge completely on its side and cut with the tip of the tool.

The parting tool could, however, be used here if you prefer it, but the cut will not be so smooth. The small groove at the top of the lamp is cut in the same way. We used the parting tool in the early stages to true the ends of the wood, but as this leaves the work rather rough, the end next to the tailstock must be cleaned up. Here again, we

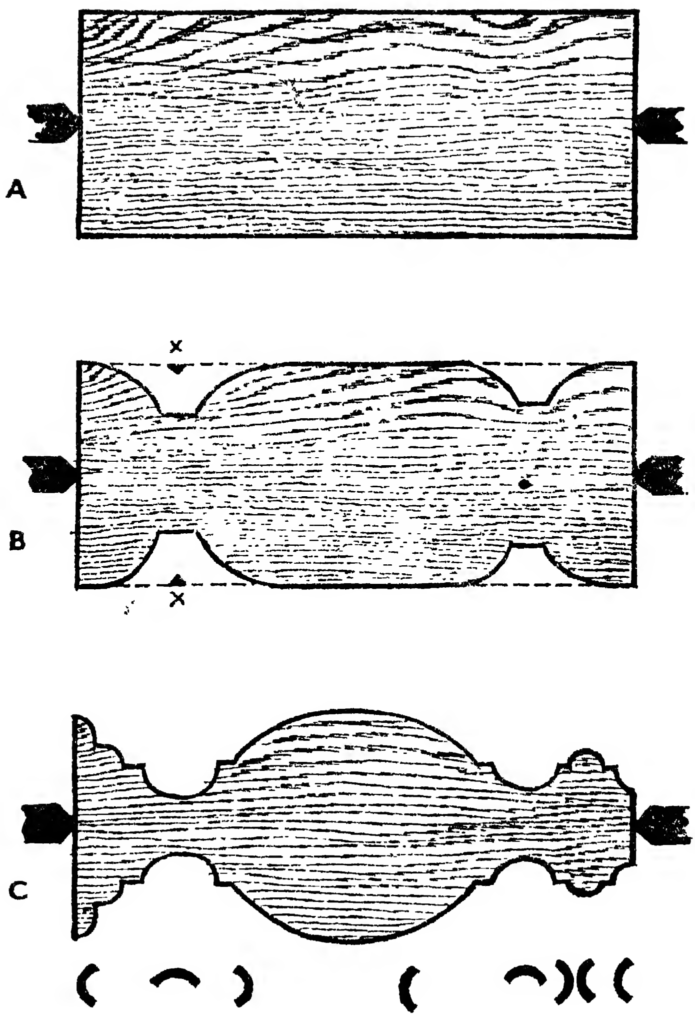


Figure 13. Shaping a cylinder of wood.

can use the ⅜ in. gouge, but turn it completely on its right side, so that you are making a slicing cut with the tip of the tool. Carry the cut right up to the tailstock centre. If you prefer it, try a cut with a long pointed or skew chisel. Grasp the tool as before, but with the long point of the chisel downwards and the bevel rubbing the end of the work, push the tool into the wood, taking off quite a light shaving.

All that remains is to sand paper the lamp smoothly and polish. Polishing will be dealt with later in the book, but when sand papering, hold the paper under the work, so that, in the event of accident, it is taken away from your hand and not forced into it.

I hope that by now, you have gained a certain amount of confidence in yourself and that you are getting the feel of your tools. Some may criticize your method of working, but there is plenty of time to master the other tools. Get confidence in yourself and your lathe and turning will almost look after itself.

You have now had a fair exercise with a gouge, so let us make a stool leg, using chisels and gouge. Part of a stool or table leg has to be left square, to enable the cabinet maker to make joints, etc., and this usually presents a problem to the amateur. Get a piece of wood about 2½ in. square and 18 in. long, preferably planed square on all four sides. Before mounting between centres, carefully mark a diagonal cross from corner to corner at each end of the wood. This will give you the true centres. Centre punch these marks and mount in the lathe between centres, screw up the tailstock and lock in position. If you are using a plain, or cup centre, in the tailstock, remember to apply a little grease or oil, to prevent burning. This is most important

Use your longest tool rest and adjust it for correct height and as close to the work as possible, remembering that you are turning a square piece of wood and you do not want to knock the corners off on the rest. It is a good idea to rotate the work by hand before starting up under power, to make

sure all is clear and the work truly centred. If it is difficult to turn by hand, this indicates that the tailstock is too tight, so slacken it off by a quarter of a turn. In this project, I propose leaving 4 or 5 in. nearest the headstock in the square. The rest of the wood will be turned. We must, then, make a cut marking the point and also to keep it square whilst turning the rest of the work. This can be done in several ways. The best way is to make a nick, using the point of the skew chisel, which will prevent the work from splintering. Holding the chisel as before, with the point downwards slightly in the direction of the tailstock, push the tool into the work, at the same time lifting the handle. Make a second cut slightly to the right of the first pass with the tool pointing slightly towards the headstock. This will cut a small V on all four corners of the wood.

Continue cutting alternately on the left and the right of this cut, until a continuous line is round the work. Remember to cut with the bevel of the tool rubbing the work. Taking a $\frac{3}{4}$ in. gouge, commence to round off the work to the right of the V-cut. Work from a point 2 in. from the tailstock progressively working back towards a point about 2 in. from the square of the work, tilting the gouge slightly on its right side and pointing in the direction of the cut. When nearing the square, reverse the position of the gouge, that is on to its left side and gradually round off the remainder taking great care not to damage the squared piece of work. An alternative method of cutting a square shoulder is to use the parting tool, although the finish will not be so good and there is a risk of splintering the wood unless the tool is really sharp. We now have the basic form for our stool leg and we can start to turn a design.

If several legs are required of the same design, it is a good idea to make a template, or lay out the design on a piece of cardboard or hardboard showing various sections and sizes. Or use a piece of wood with sharp brad points to mark all the basic features. All that is necessary is to press

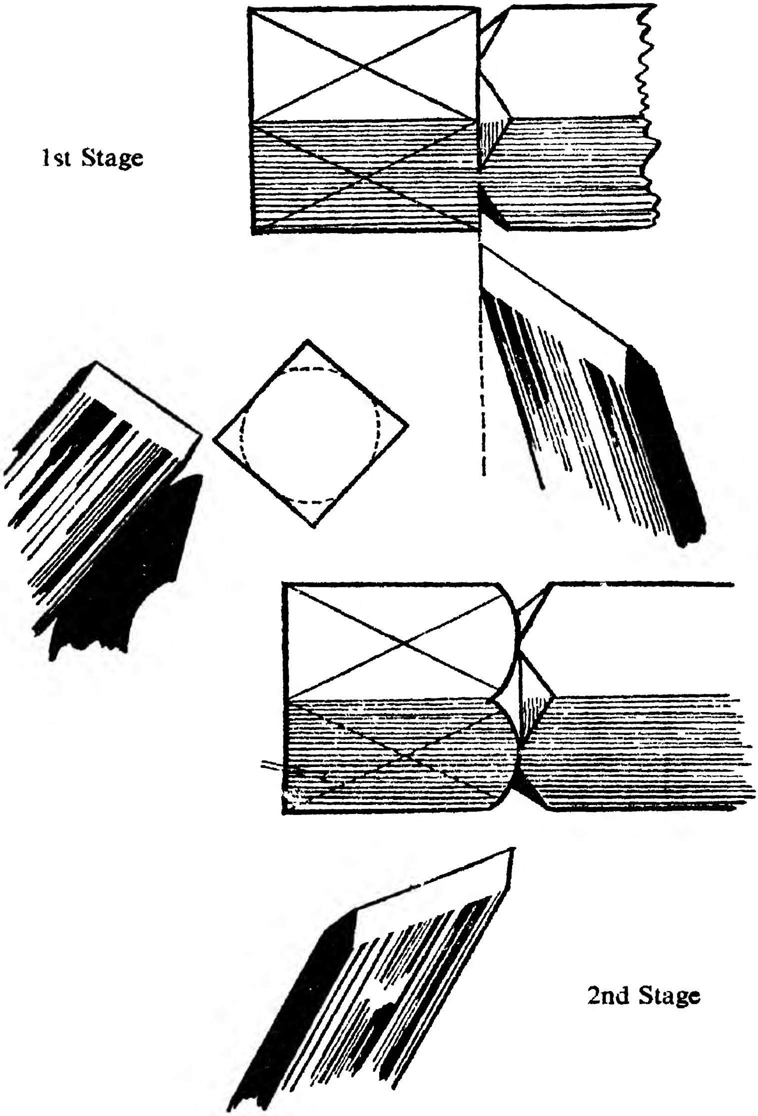


Figure 14. Turning a square to round using skew chisel.

the pattern board against the revolving work, the brad points marking the wood wherever the design changes. These templates or layout boards should always hang up in your shed for further use, when required.

Let us assume that we have our design already marked on a piece of hardboard and that it looks something like that shown in plate 7. Holding the template against the tool rest and with the work rotating about 2,000 r.p.m., mark the various changes in design on the rotating wood, with a pencil. With the parting tool, cut at these various points to the depth of the cut desired. This will leave the work looking something like plate 8. The next stage is to form the two beads. For the beginner, I would recommend using our old faithful tool, the $\frac{3}{8}$ in. half round gouge. Commencing in the centre of the bead, and holding the gouge flat on the work with the bevel rubbing, gradually twist the handle first to the right, thus turning the right-hand side of the bead, and then with the gouge again flat on its bevel in the centre of the bead, twist or roll the gouge to the left. Make two separate operations of this and on no account go backwards and forwards around the bead. Remember the very vital rule in turning of cutting from the larger diameter to the smaller.

If you are feeling really confident with your tools, the beads can be turned using a square ended or skew chisel of about $\frac{1}{2}$ in. wide. The process is exactly the same as before, but make sure the bevel of your chisel rubs all the time, and the cut is made using only the heel of the chisel, or you will be in trouble and you will have no bead left at all. The cut is started in exactly the same way as with a gouge and rolled to the left or right to form the shape. Although the chisel is more difficult to use, the finished cut is much cleaner and the points where the design changes much sharper. Our next detail is the coves, or concave cuts, at points Z. Here again you will find the $\frac{3}{8}$ in. half round gouge the best tool to use, although a lot depends on the size of the cove. It may be

necessary, in some cases, to use a much smaller gouge. The gouge is placed on edge and at right angles to the work and pointed directly at the centre of the work, the tip of the tool, only, doing all the work. The starting angle of the gouge is most important, otherwise the tool will wander all over the place. To commence the cut, push the gouge into the work and at the same time, slightly roll the tool on the rest, dropping the handle at the same time, keeping the bevel always rubbing the work. Only half of the cove is cut at a time, the gouge being reversed to cut the remaining half and gradually blending the two halves together. Don't forget, you must still cut from the larger to the smaller diameter. If you are anxious to make your work a little easier, you can make all the beads, coves and other shapes by scraping to shape with a parting tool or specially made scraper. This is not true turning and the finish will be very rough and it will be difficult to get a final finish. Remember that sand paper will not improve matters very much if the original cut is not smooth. I know of one person who calls himself a woodturner and makes all his shapes with either a rasp or coarse sand paper wound around a piece of wood. This is a poor substitute for true woodturning. Try to cut the wood the way it should be cut.

The rest of the stool leg is shaped with the ¾ in. half round gouge. Start your cut at the largest diameter and work to the right and left. Remember that the gouge must use the bevel and be held slightly at an angle, pointing the whole tool in the direction of the cut. Great care must be taken when nearing the finished shape, otherwise your beads and coves may be damaged. Wherever the design changes make a definite break in your turning. It is a very bad practice to slur or run together the different parts of the design.

If you have followed my instructions so far, you should be getting quite used to handling your selection of tools. Do not be too upset if your stool leg is not as good as you had hoped for. You will soon get 'in the groove'.

On more than one occasion I have been given a very slender piece of wood and asked to turn a fishing rod on my lathe. The customer assumes, of course, that because a fishing rod is round it is quite an easy job to turn it on a lathe. Well, you can take it from me, that this is not so. I

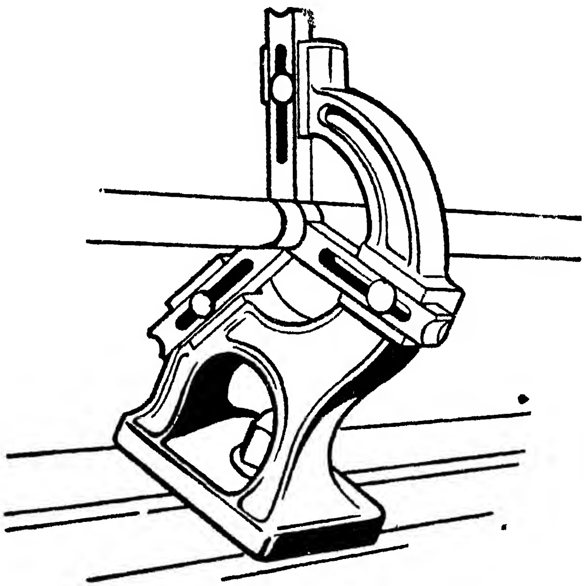


Figure 15. Lathe steady.

mention this because it brings me to the next item which is steadies.

When turning any slender work, there is always a great risk of the work bending and buckling as soon as the chisel or gouge is put to the work. The old craftsmen quite often use one hand held round the work to support it, whilst the other hand does the cutting. After a lot of practice this method can be used quite successfully, but for the amateur, I would suggest you leave this well alone. A more

positive method is to use a steady. This is a device which is usually fixed to the bed of the lathe and exerts a slight pressure against the work whilst the operator is turning, as shown in figure 15. In use, the work is first turned down to a cylinder somewhere near the centre of the work. The lathe is stopped and the steady is moved to a point on the bed of the lathe opposite this section. The three arms of the steady are then adjusted to exert a firm pressure against the wood but not sufficiently to cause overheating. A little grease or soap at points of contact will help a little here. Turning is then carried out, first to the right of the steady, and then continued to the left. The portion occupied by the steady is turned last, the steady being removed, and very light cuts being taken. If you can pluck up enough courage, it is a very good idea to support the back of the turning with the left hand, whilst this final cut is carried out.

Most manufactured steadies are made of metal and have three adjustable arms, the whole fitment being bolted to the lathe where required. Many turners would rather have a wooden steady and these are quite easily made, although they work on a different principle and adjust themselves to the work. These wooden steadies can be either fixed to the lathe bed or bolted to the workbench behind the lathe, and usually consist of a notched piece of wood, which is adjustable for height, and pivoted, so that it can be brought to bear on the work. Figure 16 shows a typical wooden steady, its operation being self explanatory. In use it is self adjustable, which is one advantage over the metal type. The three arm metal steady can also be used for supporting work when end boring, as in slender table lamps, etc. Most amateurs will probably have little use for a steady for some considerable time and, I must admit, that I seldom use one, although on some occasions it would have been very useful.

The lathes I have mentioned in an earlier chapter have a maximum distance between centres of 30 in., although larger

ones can be supplied to order. This distance is a very convenient one, as nearly all tables have legs 30 in. long and tall floor standards of 5 ft. overall length can easily be made by turning two lengths of 30 in. each. The days of extra long bedposts and newels reaching to the top of the house have

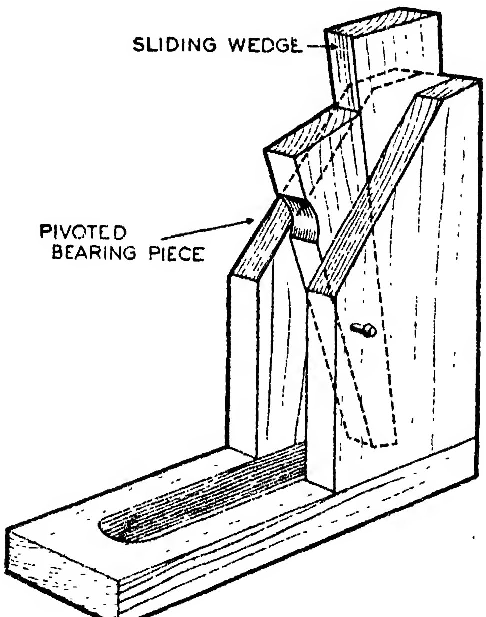


Figure 16. Homemade steady.

passed. When they were in fashion, the lathe steady was put to very good use, especially when some of the lengths of timber turned were nearly 20 ft in length. If you have no steady, do not try to turn lengths of timber less than 2 in. in diameter. If you do, you can expect the wood to jump all over the place as soon as you start to turn. Some woods, being more springy than others, really give you quite a headache. The turner can soon see whether a steady or

back support is required as spiral ridges build up as you start turning. Whenever you are turning fairly long lengths of wood, always start your shaping at the tailstock end and gradually work back towards the headstock. The reason for this is to keep the maximum amount of wood towards the driving end of the lathe to minimize the extent of bending or whipping.

If you *do* commence turning at the headstock end and you reduce the wood to 1 in. or 1½ in. in diameter, you will find it very difficult indeed to turn from a point about half way along and towards the tailstock, owing to the amount of vibration or chatter which is set up.

When your turning is completed and you stop the lathe, look and see if there are spiral ridges where there should be none. If there are, you must remove them with your cutting tool or a scraper. It is no use thinking that you can sand paper these ridges out easily because you cannot. Quite often chatter or ridging can be overcome by exerting more pressure on the bevel of the gouge or chisel, but do not take off a thicker cut in so doing. At all times in this type of turning, keep your tools really sharp. I cannot stress this latter point too much.

CHAPTER EIGHT

Types of turning

Oval turning – Square turning – Twist turning – Cabriole legs

A FRIEND of mine, who knew that I made quite a few salad bowls asked me to make her an oval one. This is possible, of course, with a little ingenuity, but I would not recommend it for the beginner. However, we can do oval turning between centres as we can do other things. Hammer handles come in this category.

Oval Turning. First of all, take a 2 in. square of wood about 12 in. long. Mark and drill a true centre hole at each end of the wood. On either side of the true centre mark and drill two small off-centre points at each end. A good idea is to draw a line with a pencil along the centre of each side. This will serve as a guide whilst turning. Mount the work in the usual way using two corresponding off-centres as centres. Before switching on the motor, turn the lathe by hand and adjust the tool rest to your favourite height, making sure that the corners of the wood do not foul the tool rest. Start your lathe up turning out a speed of about 1,500 r.p.m. which is fairly slow for anything around 2 in. in diameter. Do not be alarmed if a certain amount of vibration sets up. This is because the wood is off centre and consequently out of balance. Remember, you are now dealing with a square piece of wood which is rotating off centre, so take care where you put your fingers.

For the initial rounding off, we must have the $\frac{3}{4}$ in. gouge, used as before. Commence your cut about 2 in. from the tailstock, with the gouge twisted slightly on its right side and pointing slightly towards the tailstock. Remember to keep the bevel of the gouge rubbing the work.

Continue rounding off as previously described but only as far as the pencil marks running the whole length of the wood. Finally, smooth this off with the skew chisel, using the widest chisel you have. Wide chisels are much easier to use for this operation than the smaller ones. Only half of the actual cutting blade must be in use, and that the heel end, always with the bevel rubbing the work. If you use more than half of the chisel watch out for the point digging in. If it does, you will have to start all over again. Remove the work from the lathe and remount using the opposite pair of off-centres, the lathe still running at the same slow speed. Round off the work as before up to the pencil line.

Again remove from the lathe, and remount on the true centres and using the $\frac{3}{4}$ in. half round gouge and taking a light cut, remove the sharp points of the pencilled ridge line. Finally, sand paper nice and smooth.

The same process is adopted for tapered oval turning. The wood being first squared up and centre lines being drawn from end to end and off-centre points marked. The larger diameter portions are turned to shape first.

Square turning. I am mentioning square turning only as a point of interest as it is hardly a practical proposition for our type of lathe, but you may have seen some examples of it in old houses, in the form of balustrades or as decoration on old clocks and mantelpieces, and have wondered how it was done. Although the pieces are not truly square but slightly rounded, it is, nevertheless, known as square turning. First of all, the number of lengths of timber required for the same design are squared up with a plane. A specially prepared drum is fitted to the headstock and a similar one to the tailstock. These drums have a wide groove turned in them on one side, to the width of the prepared squares of wood. The lengths of prepared timber are then fitted into the grooves of the drums and between both centres, enough lengths being inserted until the whole assembly forms one

long continuous drum. The tailstock is tightened up and locked so that all the timbers are securely held between centres. Alternatively, the lengths of wood to be turned are clamped around the outside of the two drums, sufficient lengths being fixed by metal bands, until the whole of the circumference is filled in.

Now you have some idea of how the turning is done, and no doubt, your first thought will be that all these lengths of timber, when turned, will not be truly square on these sides, but slightly rounded, and this is where the impracticability of this type of turning comes in. If we are to have the finished lengths of timber with almost flat sides, the turning drums will have to be of a very large diameter, far greater than the swing of most of our lathes. Owing to the large diameter of this set-up, the lathe is run at a slow speed and turning commenced in the usual way and the whole length turned to pattern and sanded. The lathe is now stopped and the tailstock slackened off and this end of the drum removed. All the pieces of timber are then given one quarter turn and refixed between drum centres and turning re-commenced to the same pattern. A very accurate template is required for this process. This sequence is repeated for all four sides of the timbers, until all the turning is completed. Each operation is a separate job and must be properly sanded and finished for each side.

You have all seen tame mice on an endless route march inside a wire drum with wooden ends, well this looks very much like our square turning machine.

Twist or spiral turning. This is done in the trade by a specially constructed lathe which only does this one operation. The wood is slowly rotated and advanced over a rotating cutter. This method is not at all a practical proposition for the amateur, so we shall have to go back to the old fashioned hand method, which is only turning in so far as the wood is first made uniformly round over the required length by normal turning methods between centres. The

lathe is then stopped and the spiral marked out. The easiest way to mark out the spiral is to wrap a piece of narrow adhesive tape round the work from end to end to give the required spiral.

If your eye is not too good for symmetrical shapes, a good plan is to draw a pencil line straight from end to end of the work, then divide your length of wood into a number of equal portions pencilling these points around the work. Now wrap adhesive tape or string around the work in a spiral, commencing at the first point where the circular marks cross the pencil line running lengthways, and continuing around the work to the next point where the straight and circular pencil lines cross. Continue along the length of the marked work in this manner and you will have a set number of equal spirals. If you require only one long spiral from end to end, it will only be necessary to mark the half-way point along the work, so that your spiral is even. A pencil mark is then made on the work along the whole length of one edge of the adhesive tape. The tape is then removed. You should now have a pencilled spiral around the work to enable you to carry out the next operation, which is straightforward carpentry.

With a tenon saw and the wood still held in the lathe between centres, make a saw cut to a depth of $\frac{3}{8}$ in. along the whole pencil line, slowly turning the wood by hand whilst continuing the saw cut. A good idea is to clamp a piece of wood to your tenon saw to form a depth gouge, so that your saw cut will be of uniform depth.

Two further pencil lines are now made, one on each side of the saw cut and at a distance of $\frac{3}{8}$ in. from it, although this depends a lot on the size of the work undertaken. Now take the work out of the lathe, clamp it to your bench or in a vice and commence to chisel out a V-cut, using the pencil lines as a guide and to the depth of the saw cut. You will soon notice the spiral beginning to take shape, but take care not to cut anything off the top of the spiral or this will

reduce the overall diameter of the work. Now, round the spiral with a wood rasp or coarse sand paper wrapped around a piece of wood endways, to keep the spiral a uniform thickness. Finally, remount the spiral in the lathe and, rotating the work by hand, finish off with a medium and fine grade of sand paper.

For the more ambitious, there is the double spiral, but again, you must be something of a carpenter as well as a woodturner, to complete this. It is merely two spirals twisting around each other. First of all, lay out the marks as in the single spiral, but the sections will have to be twice as large. Draw a second line running lengthways on the opposite side of the work to the first and mark your spiral as before, starting on the pencil line. The remainder of the work is carried out using the tenon saw and chisel, as in the single spiral.

If you really want to make a masterpiece, the same process is adopted for three or four twists. A further advancement is the hollow spiral but it is not practical for a single twist as the appearance would not be symmetrical, a double twist being the most attractive. Plot your double spiral on the work as before, preferably dividing your work into four equal spirals. In the plain double spiral we had three lines forming the spiral, the centre one being the position of the saw cut. Instead of using a tenon saw, we shall use this line as a drilling line.

At this point, it will be best if the work is held in a V-block to ensure accuracy in drilling. With a brace and bit, or better still, a portable electric drill, if you have one, use a $\frac{1}{2}$ in. bit, drill holes half-way through the work along both saw cut lines. Using chisels and rasps and plenty of sand paper, the twists are finished off to shape, taking care to keep an even shape throughout the length of the twists.

During the whole operation of spiral or twist turning, the lathe is only used as a holding device and a great deal of skill and patience is required to attain perfection.

Needless to say, not many turners today take up spiral turning as it takes far too long to complete compared to normal turning, when articles can be made much more quickly. Spiral turning is best carried out using close grained hardwoods, such as walnut, maple, beech, etc.

Fluting and reeding is another decorative effect which can be applied to turning, although the work is only turned to its basic shape on the lathe, which is then only used to hold the work, the reeding being done by ordinary carpentry. With the wood held in the lathe, the part to be reeded should be divided into a number of equal parts around the work. If your lathe is fitted with an indexed head, that is a disc fixed to the headstock which has a number of equidistant points marked on it, marking out is quite a simple matter. Another way, is to wrap a piece of paper around the widest part of the turning, cutting the ends so that the paper just meets around the work. Remove the paper and, by folding, divide it up into a number of equal portions marking the folds with a pencil. Replace around the work and transfer these marked points on to the actual work. If the work is tapered, repeat this process for the narrow end, making sure that the marked points are in line with one another. This can be simplified if a pencil line is drawn centrally lengthways along the work. Parallel lines are then drawn connecting all the marked points.

The work should now be held either in a wooden vice or in a specially prepared box and the reeds carved out using normal carpentry tools, working from the large diameter to the small so that you are not cutting against the grain. If you intend to do a lot of reeded work, this can be done with the work held in the lathe and a portable router mounted on a jig running parallel with the bed of the lathe but this is probably beyond most of our needs.

Whilst dealing with work which is only part turned, we must not overlook the club-footed table leg or cabriole leg. For the club foot, the work is mounted between centres

and turned leaving a portion of the work, nearest the headstock, square. The foot of the leg, which will be at the tailstock, is turned to shape and sanded, the very end of the wood being made true. The tailstock is removed and the work remounted $\frac{1}{2}$ in. off centre at this end of the leg only. The headstock centre must not be altered. As the wood is off centre, and consequently out of balance, you must make sure your work is held securely between centres. Also reduce the speed of your lathe to about 1,500 r.p.m. for this type of work, of about 2 in. in diameter. With a $\frac{3}{8}$ in. gouge the heel

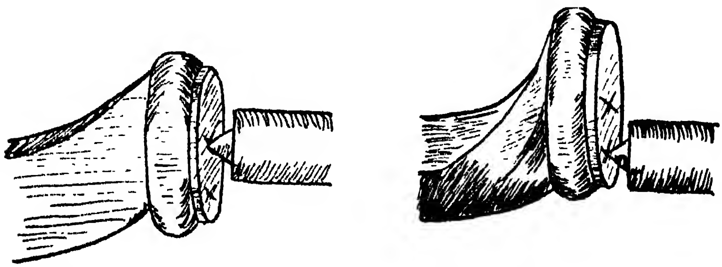


Figure 17. Turning a club foot showing position of centres.

of the club foot is turned to shape, then using a $\frac{5}{8}$ in. half round gouge, turn the remainder of the work, starting at the foot end, taking care to hold your tool firmly, as at the commencement of shaping, the tool is not in contact with the work all the time. Continue with the $\frac{3}{8}$ in. gouge, shaping the leg so that it is tapered from the foot end and gradually meeting up with the plain turned portion of the leg nearest headstock. With the lathe still running at medium speed, the leg is then well sanded with varying grades of sand paper.

If preferred, the wood can be cut to the rough shape of the leg by means of a bandsaw, but the method from then onwards is the same.

Cabriole or Queen Anne leg. Turning these legs is very much like the club foot except that the wood must be first cut to shape by means of the bandsaw. In making the leg,

Plate 1 (*above*) The use of a gouge to shape the outside of a bowl.
Plate 2 (*below*): The angle of the gouge when commencing to hollow a bowl

Plate 3 (*above*). The bowl almost completely turned on the inside.
Plate 4 (*below*). One method of laminated work. Note position of hands and gouge.

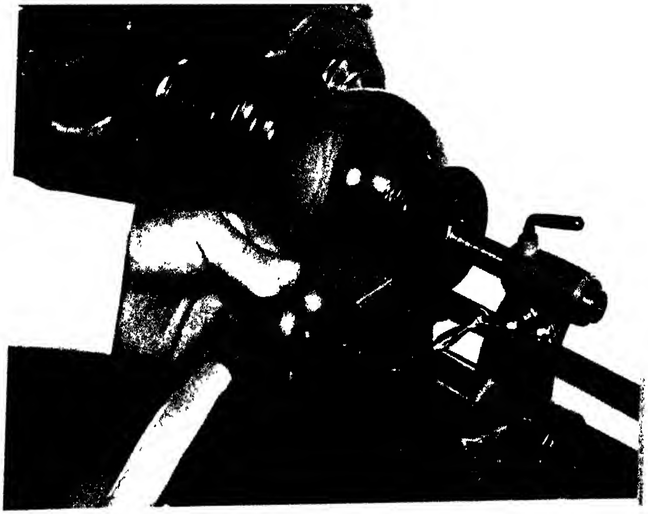


Plate 5 (*above*): A scraping tool in use, palm upwards.
Plate 6 (*below*): Rounding a large bead with a chisel. Note cutting action of point of chisel.

Plate 7 (*above*) The use of a template board when marking a cylinder of wood
Plate 8 (*below*) Marking the basic features of the design with a parting tool and template.

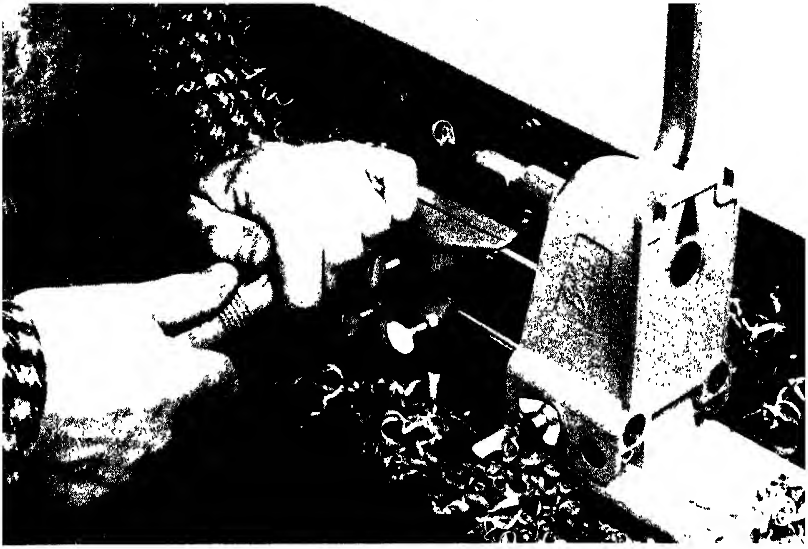
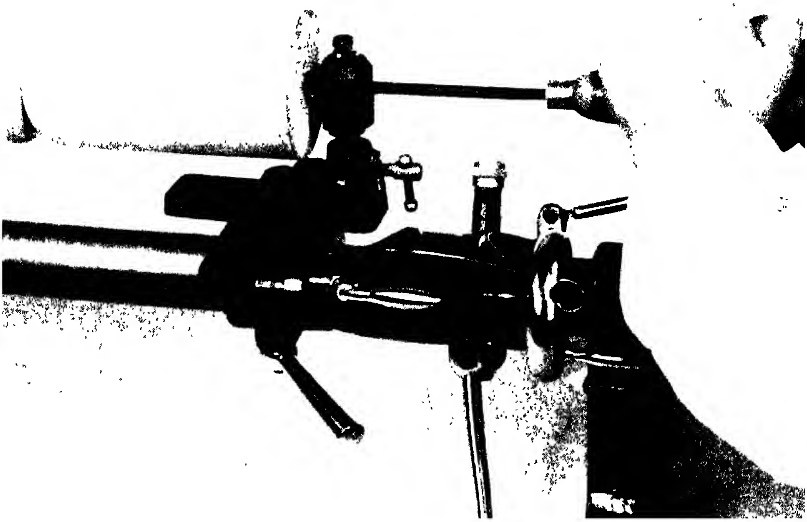


Plate 9 (*above*) A parting tool in use.
Plate 10 (*below*) A long hole boring jig in use. Note the removable tailstock.



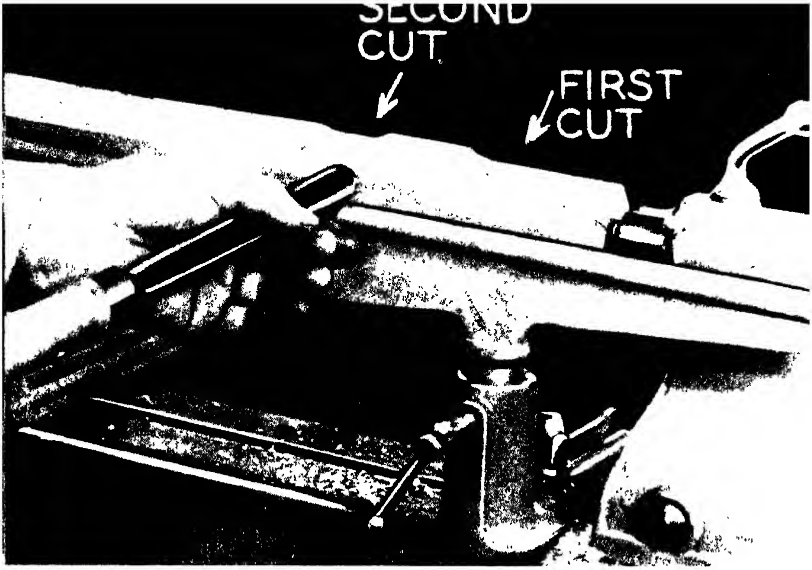


Plate 11 (*above*) Method of holding a tool in rounding a cylinder. Note the gouge on its side.

Plate 12 (*below*): The position of the gouge in shaping a small hollow.

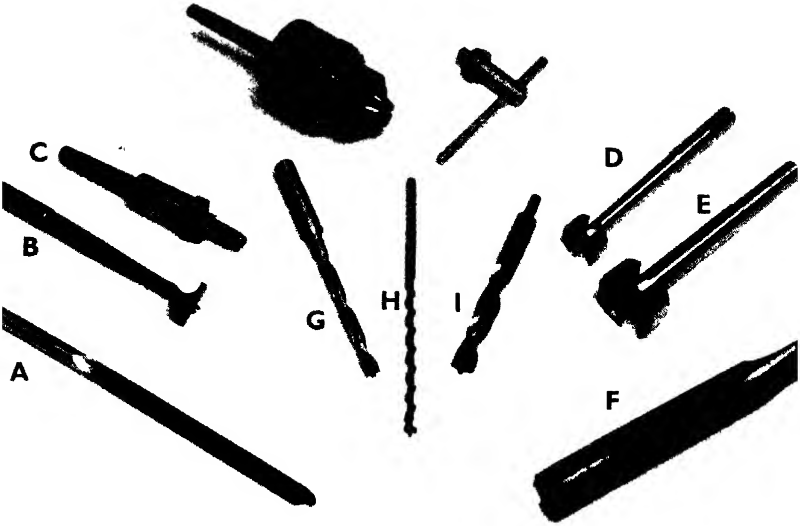


Plate 13 (*above*): Various types of boring tools: (A) parrot nose (B) centre bit (C) counter borer (D) and (E) forstner bits (F) shell auger (G), (H) & (I) twist bits

Plate 14 (*below left*): Designs for table lamps and floor standards.

Plate 15 (*below right*): Polishing work between centres. Note position of hands.

Plate 16 (*above*) Designs for a candlestick lamp, candlesticks and serviette rings
Plate 17 (*below left*) Turned cruet   Plate 18 (*below right*) Simple laminated work

the profile shape is first laid out on two adjacent sides of the wood. Now mark the centre of the foot and put a corresponding mark at the other end of the leg. This we will call the No. 1 centre. Mark another centre at the extreme heel of the leg and put a corresponding mark at the other end. You should now have two centre marks at each end of the leg.

The work is now mounted between centres on the lathe, using the No. 1 centre line. The toe and fillet are first turned taking great care not to remove too much wood. You will note that this type of leg can only be turned at the foot end, the remainder being shaped with conventional carpentry tools. The second pair of centres may not be required, but on the other hand, they may help in cleaning up the external part of the toe. It will be found more convenient if the work is left in the lathe for the final finishing with spokeshaves, rasps, etc.

Small feet made in the same manner as in the club-footed leg are very useful for giving the base of a floor standard lamp more stability. For all off centre turning you should use a good, hard, close-end, straight grained wood, for example, mahogany, walnut, sycamore, beech or maple.

The Queen Anne leg is a good example of strong wood being used.

CHAPTER NINE

Faceplate work

Speed – Using gouge and cutting action – Use of bevels – Turning bowls – Wooden chucks for special jobs – Unusual bowl turning methods – Scraping tools in use

PERHAPS the most common article in shops and stores today, which calls to mind the woodturners' art, is the wooden salad or fruit bowl, but how many people stop to wonder how it is made.

Basically this type of article is made on a faceplate, mounted on the headstock of the lathe, although there are other methods of chucking which I shall deal with later in the chapter. To find out more about faceplates and how they are used, mount a piece of wood and go through the process step by step. All wood used for faceplate work should be first cut to shape with a bandsaw, as this will limit the amount of vibration due to unbalance when the wood is rotated in the lathe. Using a 3 or 4 in. faceplate, mount a piece of wood about 8 in. in diameter and 2 in. thick, centrally, with four woodscrews. This is probably the simplest form of fixing and for some work, the screw holes can be a disadvantage.

However, at this stage, I want to give you the basic idea of faceplate turning. The speed required will be very much slower than that used for turning between centres; as the diameter of the work increases, so the speed at which the outside of the work travels will also increase. For a piece of wood 6 in. to 8 in. in diameter, a rotation speed of 600 to 800 r.p.m. will be required, and for wood 8 in. to 10 in. in diameter, 400 to 600 r.p.m. in the first step of roughing out. After the work has been trued up, this can safely be in-

creased to nearly double the r.p.m. Quite often, this depends on the type of wood being used and the nature of it.

If your disc of wood is nearly all heartwood but with a streak of sapwood on one side, a considerable amount of vibration can be expected. Consequently, the lathe will have to be run at the slowest speed all the time. On the other hand, a difficult piece of wood, such as curly grained walnut, may be easier to turn if the lathe is speeded up. You will get to know this by practice and experience.

From time to time people have discussed the merits of different turning methods and most seem to believe that scraping is the only way. I must beg to differ. The disadvantage of scraping, is that if you are not careful and your tools are not really sharp, the work will have a very rough finish, particularly on portions where there is end grain, but it is also true to say that certain articles can only be finished in this way. I prefer to use the $\frac{3}{8}$ in. half round gouge, wherever possible. If it is handled correctly, it will give a beautiful finish with very little sand papering. Once again I must remind you that bad turning cannot be put right with sand paper. In turning between centres, I stressed the point of always working with the grain or from the larger to the smaller diameter, but in faceplate work we need only consider cutting with the grain, wherever possible, or if it is against the grain, then we take a slicing cut, but always using the gouge with the bevel rubbing the work.

With your lathe set to give a turning speed of about 800 r.p.m., bring up your tool rest as close to the work as possible, and at a height which is about level with the centre line of the work. A little above the centre line will not hurt but never below, if unpleasant surprises are to be avoided. By rotating the wood manually, check that it does not foul the tool rest or lathe bed, then switch on the motor. Using a $\frac{5}{8}$ in. half round gouge, held in a similar manner to turning between centres, that is, with the palm downwards and the blade of the tool gripped in the clenched

fist or, with the palm upwards and the tool held between fingers, true the face of the wood perfectly flat. I always turn a slight hollow on this side as it will form the base of a bowl and we do not want it to rock all over the place when it is finished. A square ended scraping tool will help to flatten the base.

With the point of a skew chisel mark one or two places on the rotating work which will help to reposition the faceplate for turning the other side. With bowls, plates or for that matter, in any faceplate work, the underside is usually turned first so that any unsightly screw holes on the face side are taken out in the turning.

Using the $\frac{3}{8}$ in. half round gouge, commence to shape the outside of the bowl. With the tool on its left side pointing slightly upwards and to the left, push the tool into the work, about $\frac{1}{4}$ in. from the outside. This will take off a corner around the disc of wood. A second cut is taken in the same manner, now using the bevel of the tool rubbing the work as a guide. Continue to shape the outside of the bowl in this manner, maintaining the same tool angle and with the bevel always rubbing. On no account try to straighten up the gouge so that it is cutting on its right side, otherwise you will wonder where the tool has gone!

It will be a good idea at this stage if you stop the lathe, and rotating the wood slowly with one hand, hold the gouge against the work at the same angle as I have described and you will quickly see how the cutting action works, and also, that although it is a round piece of wood, we are using the gouge so that it cuts with the grain. Now turn the gouge so that it rests flat on the tool rest, and you will see that this gives a scraping action, and what is more, you will see the danger of the corner of the gouge digging into the wood. Understand these principles and you will find bowl turning very easy.

If you are turning the bowl on the left-hand side of the lathe, the cutting action will be reversed, as the wood is

rotating in the opposite direction. That is, your gouge will have to be on its right side and pointing to the right. When you are shaping the base of the bowl the point of the gouge, on its side, can be used. On the other hand, you may find that if your parting tool is nice and sharp, you may be happier using this. The wood should need very little sand papering but keep the paper on the move to prevent scratch rings being formed.

Remove the wood from the faceplate and remount on the base of the bowl. The chisel marks will help you to centralize the faceplate. There are more accurate methods of centring but I will come to that later. Screw the faceplate on to the mandrel and check by hand that it is rotating truly and at the same time, bring up the tool rest as close to the work as possible. The lathe is now started up under power, at the same speed as was used for turning the outside of the bowl.

The first stage in hollowing out is to make a deep V-cut with the point of the skew, about 1 in. in from the outside of the wood and about $\frac{3}{4}$ in. deep. This is to form a surface for the bevel of the $\frac{3}{8}$ in. gouge to rub against.

Using the $\frac{3}{8}$ in. (long and strong) gouge on its left side and the bevel rubbing on the innermost side of the V-cut, start to hollow out the bowl taking separate sweeps of the gouge. Continue in this manner working towards the inside of the bowl and gradually getting deeper. From time to time, take a cut on the other side of the V-cut, but, of course, with the position of the gouge reversed, that is, on its right side, but leaving sufficient wood to keep the outside of the bowl reasonably thick. Working in this manner, the whole of the inside of the bowl can be removed and all that will remain can be removed with a round nosed scraping tool—one of those you made from an old file will do the job nicely. If you stop to think for one moment, you will appreciate that in using the gouge to hollow the bowl in this manner, you are cutting the wood with the grain. As you

work deeper into the bowl the general stiffness of the long and strong gouge will be helpful and, where possible, readjust the tool rest so that it is still as close to the work as you can get it. Do not adjust your tool rest whilst the work is rotating for it is quite easy to trap your fingers between tool rest and wood and it is most painful.

Bowl turning can be accomplished by the scraping method and some people will probably find this much easier than using the gouge, but unfortunately it is quite easy to damage the fibres of the wood and make finishing much more difficult. For scraping, the spear-pointed chisel can be used to remove the majority of the wood. The tool rest is adjusted so that the cutting edge of the chisel is on the centre line of the work. The outside of the bowl is first cut to shape with the spear-pointed chisel and this will give quite a rough finish, particularly on the end grain. A square ended scraping tool or square chisel is used to take the final cuts.

The bowl is remounted on the faceplate as before and the inside of the bowl removed first with the spear point. It will be easier if a hole of about 1 in. in diameter is first bored in the centre of the bowl and to the required inside depth. The spear pointed chisel is then used in such a manner as to gradually widen the diameter of this starting point, until the whole of the inside of the bowl is removed. Finish the inside taking light cuts with sharp scraping tools which fit the contours of the work. The need for various homemade-scraping tools will soon become apparent, as they cannot be bought to the required shape.

There is one big disadvantage of turning bowls secured by woodscrews to a faceplate and that is the comparative ease of hollowing out a perfect bowl, only to find when you stop the lathe, that you have three or four screw ends looking at you in the bottom of the bowl. Before hollowing out, make sure you know just how far the screws are in the wood.

One method of obviating screw holes in the finished work, is to first of all screw a block of wood to the faceplate.

This is then turned to the same diameter as the faceplate. The disc of wood for your bowl must then be made smooth and flat on one side, either by hand planing or sanding. This is then stuck centrally to the wooden faceplate block, with a piece of newspaper sandwiched in between. Allow time for the glue to set. Commence to turn the outside of the bowl with whichever method you prefer but the shaping will be different from the previous method, as the base of the bowl is to be the position which is stuck to the faceplate. Take light cuts, or else you will force the bowl off its paper fixing. The inside of the bowl is turned in the normal way, and as we have no woodscrews to look out for, can be turned to a much thinner section. After sanding and polishing the lathe is stopped and, with a sharp blow with your fist, the paper fixing on the base can be easily broken and the bowl removed. Finally sand and scrape the paper away from the base of the bowl.

If you contemplate making a number of bowls, you will want a much quicker way than the glue and paper fixing method and for this the hollow wooden chuck is the answer. To use this type of chuck, you must have plenty of confidence in your turning methods, as any jabbing in of the tool will have your bowl zooming around the workshop like a flying saucer.

The first operation in making a hollow chuck is to screw a piece of wood to your faceplate, the diameter being about 1 in. to $1\frac{1}{2}$ in. larger than the base of your proposed bowls. Take another odd scrap of wood, about 6 in. long, and two brads or small nails and drive them in at a distance apart which will be equal to half the diameter of the base of the bowls. Sharpen the heads of these two nails to a sharp point. This will be our marking gouge to ensure that the bases of all the bowls you turn have the same diameter. With the faceplate and auxiliary block of wood only mounted on your lathe, start the lathe up to turn at about 1,000 r.p.m. Take your marking stick—the piece of wood

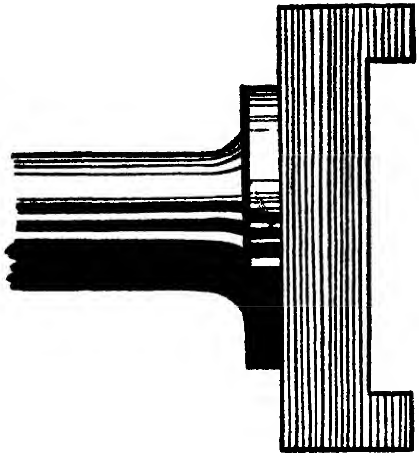


Figure 18. Hollow wooden chuck.

with the nail points in it—and press one point into the centre of the revolving wooden faceplate and at the same time, press the other so as to make a continuous mark around the faceplate. With a spear-pointed chisel or parting tool, hollow out this portion up to the marked line and to a depth of $\frac{3}{8}$ in., taking care to keep the rim of the hollow perfectly square and flat and exactly to the marked line. If the edges of the hollow are slightly rough do not worry about it, as it is an advantage not to have them really smooth. This then,

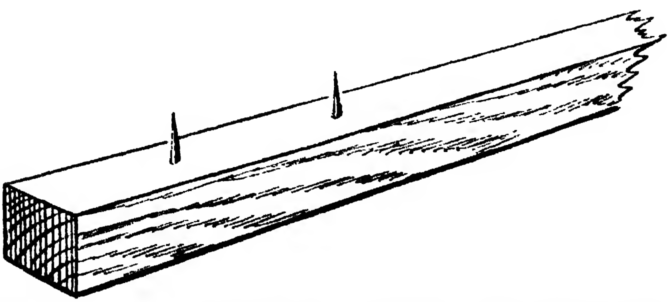


Figure 19. Marking stick used in conjunction with hollow chuck.

is your hollow chuck which you will always find very useful. Before removing the hollow chuck from the faceplate, register marks should be made on both faceplate and chuck, so that in subsequent operations they can be remounted together exactly as when turned.

The block of wood for your bowl is first mounted to a faceplate, fixing with woodscrews. The base side of the bowl is then turned perfectly flat. With the point of a skew chisel make a slight depression in the dead centre of the work. This will be easily done, as when the wood is rotating, the centre of the work can be easily seen. Taking up your base marker, press one point lightly into the centre of the work, holding it between both hands and supported by the tool rest. Then push the other point so that it scribes a mark on the base of the bowl. This then, is to be the finished size of the base. Commence to turn in the normal way, preferably using the $\frac{3}{8}$ in. gouge, and shape the outside of the bowl, being very careful not to cut too close to the marked line on the base. When satisfied that the outside shape is to your liking, carefully shape the base so as to give it a definite step where it joins the curvature of the bowl, thus making the base about $\frac{1}{2}$ in. thick. Use the point of a skew chisel for this operation and cut exactly to the scribed mark, keeping the chisel flat on the tool rest. Using a slightly rounded scraping tool slightly hollow the base, partly to remove the centre mark and also to ensure that the bowl will not rock about but will lie flat on the table, when it is finished.

The whole of the outside of the bowl, including the base, should now be lightly sanded and polished. It always looks much better to pick up a bowl which has a nicely polished base. Remove the bowl from the face plate and screw on the wooden chuck which you previously made, making quite sure that it is put on in the same position in which it was taken off. The register marks will help you to do that. If you have turned the base of your bowl accurately,

you will find it is a good tight fit in the hollow chuck. If not, a sheet of newspaper sandwiched between the chuck and the base will help to hold it securely. A little persuasion with a wooden mallet will help if it is too tight. The whole operation of hollowing out the bowl will depend on this being a very good fit. Before switching on the lathe, turn the work round by hand to ensure that the bowl is mounted truly. Hollowing out can now be done, using the $\frac{3}{8}$ in. long and strong gouge and taking light cuts, as the bowl is only held on to the chuck by the accurate fit of the base. Keep the tool rest as close to the work as possible all the time. Finish off with light cuts with a scraper, if necessary. Sand and polish the inside of the bowl.

To remove from the chuck, all that is needed is a smart blow with your fist on the underside of the bowl whilst supporting it with the other hand. You now have a bowl with no unsightly fixing marks on the base. The chuck and base marking stick should be kept together in some safe place for further use. It is a very good idea to make several of these chucks and marker sticks of various sizes as they always come in very useful.

There is another method of bowl turning which is practised quite a lot in different parts of Europe and which is very similar to the last method, except that the wood for a bowl is first hollowed out and the base and underside turned last. Again we require a marking stick, but this time the distance between the two pins is equal to the radius or half of the diameter of the inside of the bowl measured at the rim. The wooden chuck, which is screwed to a faceplate, is turned to the same diameter and shape as the inside of the proposed bowl, using the marker stick to get the correct outside diameter. The bowl is then first screwed to a faceplate and the inside turned to shape but making the rim slightly smaller in diameter than the sides of the bowl. This should be turned and polished in the usual way. To turn the outside, the bowl is mounted over the prepared wooden

chuck and is held tightly by the wooden rim. Newspaper will again help to get a good tight fit, although in this method, the bowl is less likely to be forced out of the chuck, as the shaping action of the outside of the bowl tends to keep the wood pushed well home on the wooden chuck. One advantage of this type of chucking is that bowls which have no definite bases can be turned.

If bowl turning is to be your chief concern several of these chucks should be made up in different sizes.

With all bowl turning more than half of the wood is wasted in chips and shavings thus the price of them is usually very high. To overcome this wastage there is yet another method of bowl turning, in which a number of bowls of different sizes are turned out of one block of wood. Although quite interesting, it is not to be recommended for the beginner, but I think you will like to know about it and as your skill advances, perhaps you would like to try it.

A very large disc of wood is mounted on a faceplate in the normal way, trued up and the outside turned to shape; the base of the bowl being that portion held by the faceplate. The front of the block is then turned flat.

Using normal scraping tools and a specially shaped scraping tool, which looks very much like a sickle with a sharpened hooked end, a small bowl is first hollowed out in the centre of the block, using the round nosed scraping tool. Around this a circle is described and the piece, forming a small bowl, is cut away with the curved tool. This will leave a hollow, which is scraped to shape to form a second and larger bowl. Again the curved scraper is brought into use and the outside of the second bowl is shaped and cut away from the block. This process continues until the whole of the block is made up into graded sizes of bowls.

One disadvantage of this type of turning is that the outsides of the bowls cannot be finished properly in this operation but have to be remounted on specially shaped chucks to finish the underside. In the old days, this type of bowl was

used chiefly by tradesmen to keep money in and for domestic use.

One of the biggest problems in bowl turning is getting a good supply of well-seasoned wood and this is not always an easy task. However, it is possible to turn bowls using fresh sawn wood, if certain precautions are taken. The discs of wood should first be prepared by bandsawing to shape. The disc is then screwed to a faceplate in the usual way, and turned, shaping the outside so that the portion attached to the faceplate forms the base. The inside is then hollowed out but not all the wood is removed. It should be turned so that the side and base of the bowl are about an inch thick. The bowl is removed from the lathe and placed in a dry airy position for about six weeks: a shelf made of wire netting is a good place.

After this period, the wood should be quite dry and free from splits. It is then remounted on the faceplate, trued up and turned to the finished shape. The wood will have probably warped a little in the drying process but as we left sufficient wood in the first stage, this is soon put right in the final turning. If you propose to keep some wet discs of wood for drying, first of all seal the grain with melted tallow or thick paint, around the outside of the discs. If you do not, they will be useless when you come to use them because they will have splits and shakes in the end grain.

CHAPTER TEN

Woodscrew chuck

Small bowls – Egg cups – Drawer knobs

ONE of the most useful attachments the woodturner can have for the lathe is the woodscrew chuck. This consists of a small faceplate, between $1\frac{1}{2}$ in. and $2\frac{1}{2}$ in. in diameter, which is screwed on to the mandrel. In the centre an ordinary woodscrew is fixed, either being welded into position or held by a special clamping device, which allows for the screw to be easily adjusted for length and changed if it becomes damaged. This type of chuck is indispensable for turning small parts such as door knobs, egg cups and small bowls, although with care in turning, bowls of up to 12 in. in diameter can be turned quite safely, using this chuck. Woodscrew chucks of $2\frac{1}{2}$ in. diameter usually have two or three holes drilled in them, so that the work can be held more securely by additional woodscrews.

Now let us put the woodscrew to use and make an egg cup. This is perhaps, the first project the beginner will wish to make, to prove to his wife that he is not just wasting his time. First of all, cut a block of wood $2\frac{1}{2}$ in. square and 4 in. long, the grain running lengthwise down the wood; make sure the ends are cut perfectly square. Draw pencil lines from corner to corner at one end of the wood to find the correct centre. At the centre drill a hole about $\frac{1}{16}$ in. diameter and $\frac{3}{4}$ in. deep, then screw the work on to the woodscrew chuck. Bring up the tool rest to the correct height, that is, level with the centre line of the work, and as close to the work as possible. Turning the lathe by hand, check that the work will not foul the tool rest. For additional support of the work in the roughing out stage, the tailstock can be brought up to support the other end of the wood,

although this is not absolutely essential. The lathe is then started under power to turn the work at about, 2,000 r.p.m. Using a $\frac{5}{8}$ in. half round gouge, round off the work as described in turning between centres; turn to a true cylinder, although at this stage it is not necessary to obtain a smooth finish. The next step is to hollow out the egg cup, and several methods can be employed. The easiest is first of all to drill a hole about $\frac{1}{2}$ in. in diameter, to the depth of the inside of the cup at the tailstock end of the work. If your lathe has a tailstock fitted with a No. 1 or 2 Morse taper, use a normal three-jaw chuck mounted in it. The $\frac{1}{2}$ in. hole can then be easily bored with the lathe rotating and advancing the tailstock into the work, boring to the depth required. If you plan to make many egg cups cut a piece of cardboard to the shape of the inside of the cup, making sure that it is the size of a hen's egg and not a pigeon's! There are a lot of egg cup sets on the market today that will not hold the average size egg and we do want our cup to serve its purpose.

Remove the tailstock away from the work and put it out of the way at the other end of the lathe. Bring the tool rest up to the end of the work and at right angles to the lathe bed, the height of the rest being level with the centre line. Remove the centre of the wood, using a parting tool, working on the left hand side of the hole and gradually roughing out the inside to shape. Do not take too heavy a cut, otherwise you will run the risk of forcing the wood off the woodscrew chuck. If there is any tendency to chatter, lower the tool rest slightly. Finish the inside using a round nosed scraping tool, starting in the centre and working to the outside, using a sweeping action with the handle and holding the blade in the same position on the tool rest. Reposition the tool rest so that it is parallel with the work, and with the parting tool make a groove in the wood, about 1 in. from the woodscrew chuck end. This will mark the position of the base of the egg cup. The outside can now be turned to shape using a $\frac{5}{8}$ in. half round gouge,

remembering to turn from the larger diameter portions to the smaller. If the outside shape is to resemble a barrel, you may find it more convenient to use the skew chisel, as this gives a smoother finish.

After sanding and polishing, the egg cup is cut away from the waste stock with the parting tool being used in the normal way, at the marked point near the chuck. When the parting cut is nearly through to the centre of the work, the egg cup should be supported with the left hand, whilst the right hand pushes the parting tool for the final cut.

Serviette rings can be made in a similar manner, the only difference being that the inside of the piece of wood is hollowed out leaving the sides parallel. First of all the outside is rounded as in the case of the egg cup and a $\frac{1}{2}$ in. hole bored down the end of the wood. The tool rest is then brought up to the end of the wood and at right angles to the lathe bed and the $\frac{1}{2}$ in. hole enlarged to about $1\frac{1}{2}$ in. diameter using a parting tool or the point of a skew chisel. The length of the hole should be 1 in. to $1\frac{1}{2}$ in. Measure the actual depth of the hollowed inside and mark the point on the outside of the work. Using a $\frac{3}{8}$ in. gouge, shape the outside up to the pencil mark, being careful not to cut the ring off at this stage. Remember that you are turning a hollowed out piece of wood, the walls of which are probably only $\frac{1}{4}$ in. thick. Sand the ring inside and out and polish the inside only, finally cut away with the corner of a skew chisel, *not* the parting tool, as this will damage the thin shell of the ring.

You are probably wondering about the polishing of the outside, well, this cannot be done at this stage as the cutting of the ring away from the stock would only damage it. To polish the outside, get another block of wood about 3 or 4 in. long and 2 in. square, mount it on the woodscrew chuck and turn it to a gradual taper which will fit the inside of the serviette ring, so that three-quarters of the ring only, is supported, by the taper. The outside of the serviette

ring can now be polished and the edges sanded, if required. Keep this block in a safe place. You will probably need it again sometime.

One big advantage of the woodscrew chuck is that articles can be turned and remounted at a later date for finishing. If a number of similar articles are required, it is a good idea to turn them all separately and remount them later so that they can all be finished simultaneously. Door and drawer knobs are a common item for which the turner is asked and you may wonder which is the best way to tackle these. More often than not you will be given a pattern, but if not, make one out of hardboard. It will be useful in the future.

Mount a block of wood on the screw chuck of suitable size, allowing sufficient length to turn a pin or dowel on the end of the knob, as this is the usual fixing method in a piece of furniture. Round off the block with a suitable size half round gouge, to within $\frac{1}{8}$ in. of the finished overall diameter. The end of the block farthest from the screw chuck will be the outside of the knob. Using the parting tool, mark a position on the block of wood to indicate the length of the knob, excluding the fixing pin or dowel, making a cut about $\frac{1}{2}$ in. deep. Shape the knob using our much used $\frac{3}{8}$ in. half round gouge, although some work may call for a smaller gouge.

You may perhaps be thinking that the $\frac{3}{8}$ in. gouge is the only tool I ever use; well, I do use it a lot, as I think it is the easiest tool to use for most jobs, but if you think that you can do better in some places with a skew chisel, go ahead and use it. There are no hard and fast rules in woodturning; a lot of it is a matter of choice.

Having turned the knob to shape with the gouge you can round off the end of the work using a skew chisel as this will give a clean cut on the end grain, the heel of the chisel only being used. Sand and polish while still rotating on the lathe. Taking up the parting tool again shape a portion of the wood between the first parting cut and the screw chuck

to form a suitable size pin or dowel. Finally cut away the completed knob, supporting the work with one hand and using the parting tool with the other. With work of this type, never make the pin first as there will be insufficient support for the remainder of the work whilst you are turning.

Small bowls of up to eight or nine inches in diameter can be turned quite satisfactorily on the single screw fixing of the woodscrew chuck and can always be remounted for further finishing if required, as the work will always be mounted centrally. One thing that the turner must be careful about is the hollowing out process. Always make a mental note of the length of the woodscrew fixing or otherwise you will cut the end off it whilst hollowing your bowl and consequently spoil it. If a number 12 screw is used, $\frac{1}{2}$ in. or $\frac{3}{4}$ in. will be sufficient length to obtain satisfactory fixing for a 9 in. bowl. On the other hand, should you be screwing the chuck into end grain, then a longer length of screw will be required. The modern adjustable woodscrew chuck has the advantage of varying the length of fixing screw.

To make a bowl on the woodscrew chuck, first make a small hole with a bradawl in the centre of one side of a disc of wood. Mount on the chuck and turn the outside to shape, using the method you prefer, with the lathe speed about 1,000 r.p.m. Then with a bradawl supported on the tool rest, make a hole about $\frac{1}{2}$ in. deep in the centre of the rotating work: do not go any deeper than this. Sand and polish the outside before stopping the lathe. Remove the block of wood from the lathe and remount on the chuck using the new centre fixing, and shape the inside, but do not forget that woodscrew point hidden in the bottom of the bowl. With care, very much larger bowls can be turned on this type of chuck, but additional fixing screw can be used if preferred.

Whatever items are turned on the woodscrew chuck, always try to arrange your method of working so that the screw fixing hole is not on the face side of the finished

work and that it can be removed by some subsequent operation, such as drilling. For example, the lid of a powder bowl could quite well be turned on a screw chuck, but owing to the thickness of the wood in use, it would be impossible to hide the screw fixing hole. In such a case, the hole is bored out to say, $\frac{3}{8}$ in., and a small turned knob with a similar size fixing pin fitted in it.

When using the woodscrew chuck for turning heavy or large diameter work, it is a good plan to insert a piece of folded glasspaper between chuck and work to obtain a more positive drive and where possible, use your tools so that the wood is cut and not scraped to shape. Cutting puts less strain on the screw centre.

For long heavy work, such as a wooden vase, I recommend that the tailstock be brought up to bear on the end of the wood during the initial shaping of the outside, and kept in this position until the whole of the outside is turned and polished. Let us, then, look at the operations required to turn a vase of about 4 in. in diameter and 10 in. long. The wood is first mounted on the woodscrew chuck in the same manner as in the making of an egg cup, and as this is a rather heavy piece of wood, two or three additional fixing screws could be used, to be on the safe side, although this is not absolutely necessary. The tailstock is brought up to support the other end of the wood and turning commenced using a $\frac{3}{8}$ in. half round gouge. After sanding and polishing the outside, a three-jaw chuck is inserted in the tailstock and a $1\frac{1}{8}$ in. hole bored nearly down to the bottom of the vase and about 1 in. from the face of the woodscrew chuck. If the lathe is rotating at about 1,000 r.p.m. you will find it quite easy to bore the hole.

The next step is to enlarge this hole using a parting tool or skew chisel, although I prefer a good old mortice chisel ground to a nice scraping edge. Remember in this hollowing out process you are cutting end grain wood and progress will be slow and plenty of patience is required.

Take out sufficient wood from the inside so that a small glass tumbler will fit quite loosely—simple isn't it?

Another use for the woodscrew chuck is as a holder for other simple wooden chucks. For instance, you may wish to shape small pieces of dowel, and such things are always difficult to hold if you have no suitable adjustable chuck. To make a small counter chuck, all that is necessary is to mount a block of wood on the woodscrew and turn to a cylinder. Then with the parting tool or skew chisel, make a hole in the end of the wood which is slightly tapered in diameter so that the article to be held is a good push fit.

I have several of these counter chucks of differing sizes and find a great deal of use for them.

CHAPTER ELEVEN

Boring long holes

Types of boring tools and uses

ALTHOUGH the lathe is primarily intended for turning, it can be converted into a very satisfactory horizontal drill press, with the addition of an adjustable three-jaw chuck. Most lathes, as I have already said, have the mandrel and tailstock bored to a No. 1 or No. 2 Morse taper. All that is required then, is a three-jaw chuck fitted with a Morse taper spill or shaft. The Jacobs pattern chuck is the best type to have, as the drills can be held more securely. Some lathes can be fitted with a flexible drive which will allow you to carry out drilling, buffing, etc., away from the lathe.

For drilling small holes the wood can be held in the hand and just pushed on to the drill, but for longer holes, such as for a table lamp, the tailstock can be used to feed the work on to the drill. This is not the best method for holes over 9 in. long, but it is quick and fairly accurate. Assuming that you have turned a table lamp about 7 in. long, and polished it, you will notice when it is removed from the lathe, the two centre marks at either end. Mount a three-jaw chuck in the headstock with a $\frac{5}{16}$ in. drill inserted and have the lathe rotating at about 1,000 r.p.m. Push the table lamp on to the drill, using one of the centre marks as the starting point and advance the tailstock up to the work so that it supports the table lamp on the other centre mark. Holding the work with the left hand, gradually advance the tailstock and drill about half-way through the wood. Remove the tailstock and reverse the wood so that you can bore the other end of the work, and repeat the process. Some of you may think that this is a bit of a hit or miss idea but if you

have several dozen articles all to be bored out, then you will find this quite a time saver. The two holes always meet in the centre of the work, especially if you let the drill do the boring and do not apply undue pressure on the tailstock.

For those who prefer a more accurate method, then there is the long hole boring method, very accurate, but a bit long-winded if you have a lot to do. The process is as follows. Let us assume that you have turned a floor standard of about 5 ft. high, made up of two separate pieces, each of 30 in. Each separate piece should have a 1 in. diameter pin or dowel turned at one end. This will enable the two pieces to be joined together and also fixed to the base. A boring jig is now required (plate 10). Every maker differs slightly, but the general principle in use is the same. The jig consists of an adjustable ring centre which is held in the tool rest at the tailstock end. The piece of wood to be drilled is held at the headstock end on the normal driving centre and by a plain pointed centre in the tailstock, which is passed through the ring centre. The tailstock is then advanced slightly so that the wood is held firmly on the driving centre. Switch on the lathe, so that the work rotates at about 1,200 to 1,400 r.p.m. and at the same time screw the ring centre into the work, applying a little drop of oil or grease whilst doing this. The work is now supported at the tailstock end by the ring centre so that the tailstock can be withdrawn and removed completely from the lathe bed. Some lathes, having a completely hollow tailstock, have a specially made ring centre for this process, and a separate boring jig is not required. The wood is now ready for boring. The drill used is about 24 in. long and of such a shape that it will not wander. It looks very much like a piece of tubing sealed at one end and half cut away lengthwise, and is known as a shell auger (see plate 13F).

These shell augers are made in various sizes from $\frac{1}{4}$ in. upwards and are used with a corresponding sized ring centre. For our lamp standard use one of $\frac{5}{16}$ in. preferably, as

this is the correct size to take a brass pillar nipple to screw on the lampholder. For the actual boring operation, the wood must rotate at about 1,400 r.p.m. but definitely not slower than 1,000 r.p.m. Push the auger through the ring centre and into the wood; every 2 or 3 in. remove and clear the drillings otherwise you will clog the hole and jam the drill. A spot of grease applied from time to time to the auger will make drilling comparatively easy. Do not apply undue pressure or the drill will wander. Keep it nice and sharp. This brings me to another point. Always sharpen this type of drill on the inside of the cutting edge, otherwise you will reduce the actual cutting face.

Continue boring to a point a little over half-way through the wood. Remove the work from the lathe and replace the pronged driving centre with a counter boring tool. This looks very much like a four-pronged centre but the spurs are shaped to have a cutting action, and in the centre is an interchangeable guide pin or pilot of similar diameter to the auger being used, see plate 13C. Return the wood to the lathe, but the wood is now reversed and supported on one end by the counter boring tool, using the hole you have just bored, as a centre. The tailstock end is again supported by the ring centre as previously described. The shell auger is brought into use again and boring continued until the two holes meet.

If you have paid attention to the lathe speed and the sharpness of the auger, you will have no difficulty in making the two holes meet. Although the spurs of the counter boring tool are designed as a cutter when pressure is applied from the tailstock, it can be used as a driving centre. Repeat this process for the other piece of your lamp standard. The two pieces must now be fitted together. The top portion of the lamp standard had a pin or dowel turned on one end, and this should have been made the same diameter as the overall diameter of the counter borer. The bottom portion of the standard lamp should now be

mounted loosely between counter borer and tailstock. The lathe is then rotated at about 1,000 r.p.m. and the wood is held firmly with the left hand, and the right hand advances the tailstock so that the counter borer cuts into the wood. The pilot will follow the hole previously drilled, thus ensuring a parallel hole being drilled by the counter borer. Continue to advance the tailstock, until sufficient depth has been bored out to take the pin of the upper portion. It may be necessary to stop the lathe from time to time to remove the waste, in order to maintain a clean cutting action.

For shorter holes there are a number of different types of bits that can be used, the most useful being a normal twist bit, as used in metal drilling. This drill can be used in its standard form, but it will cut better and be easier to handle if a small point or spur is ground at the nose, as in plate 13G and I. In use, a speed of 1,000 r.p.m. will be ample but it may be necessary on medium length holes to withdraw the bit from the wood to clear the waste wood. Another type is the Jennings pattern, a very common type which is used with a brace and bit. When using it in a power driven machine, it is advisable to grind off the thread in the centre spur, to a diamond point, thus preventing the bit pulling itself into the work and consequently boring farther than you intended. Many cheap drills on the market sold for use with power tools are not suitable for the work intended, the most common fault being that the twist of the bit is badly designed and therefore pulls itself into the wood. At all times the operator must be able to control his drilling. and not the drill control the operator.

For holes over $\frac{3}{4}$ in. diameter, the cheapest form of bit is the carpenter's centre bit, with the square end removed and the threaded centre spur ground to a plain diamond point, although deep holes drilled with these bits will very often wander, particularly when boring end grain. If deep holes are required, using the centre bit, it is a good idea first of all to drill a pilot hole of about $\frac{1}{16}$ in. diameter, which will

prevent the bit from wandering off course. I have used centre bits of this type for many years, as they are cheap enough to be able to throw them away when they become damaged.

If it is accuracy and perfection in drilling that you are after, then the Forstner pattern bits are the ones to go in for, although the price is a bit high for some people. This bit has two cutting edges and will definitely not wander, either with the grain or across it. I did many years of woodturning before I treated myself to a set of these bits, but they were well worth waiting for.

For some types of work, the tailstock is used to push the wood on to the drill, and to have some blocks of wood that will fit over the barrel of the tailstock, will prevent the drills becoming damaged. For faceplate work which may require drilling in the centre, for example, a base for a small table lamp, etc., the wood can be drilled using a small 'long and strong' gouge, pushed into the centre of the rotating wood. This will cut a very clean bore, very much in the same manner as the parrot or spoon bit.

Drilling can also be done by holding the drill stationary in a chuck mounted in the tailstock, the drill being fed into the rotating work by the tailstock handle. Specific depths of drilling can be set by pencilling a mark on the drill or by wrapping a piece of adhesive tape around the drill. Quite often one is called upon to drill a very large diameter hole. In this case the end of the wood to be drilled is first rounded off, then this portion is supported either by a three-jaw steady mounted in the tool rest, or by a block of hardwood, previously bored to take the rounded portion of the work, mounted on the lathe bed and lubricated with soap or grease as shown. Drilling is carried out with the chuck mounted in the tailstock.

The speed for drilling, of course, varies with the size of the drill, but 1,000 r.p.m. is the fastest speed you should use, and for holes over 1 in. in diameter, 500 r.p.m. to 750 r.p.m. Keep all your drills sharp. Too much force

applied to a drill to make it cut faster will only result in the drill wandering. Except in the case of centre bits, try and buy all your bits having two balanced cutters, then you will not be troubled very much with crooked drilling.

Much could be written about drills and drilling but as woodturning is our subject, let's not get too mixed up with 'bits and pieces'! However, a few words on the care of your drilling and boring tools, will help you to keep them in good order. Most amateurs sharpen their drills far more than is necessary and consequently, the life of them is very much shortened. Before sharpening any bit, carefully examine the shape of the cutting edge, and when filing, make an endeavour to retain the original shape. With bits having two cutting edges, try and keep an even balance of these edges, so that each side, when in use, does the same amount of work, both sides being filed equally, then you will keep the bit boring true. Use a very smooth file taking a light cut, the object being to remove as little metal as possible. The cutting edges should be sharpened on the underside only, never on the top side, otherwise you will spoil the cutting action. Where the bit has side spurs, these should only be sharpened on the inside. If you file on the outside of the spurs, you will reduce the outside diameter at the tip, with the result that the bit will bind and clog without boring. Never attempt to sharpen wood boring bits by grinding; the only exception being bits with a drill nose, such as twist drills used for metal.

CHAPTER TWELVE

Timber

Types and suitability – What to look for when purchasing – Seasoning, cutting out, storing

I CAN well remember my first approach to woodturning, and the subsequent visit to the timber yard in search of a few suitable pieces of wood. All I knew was that I wanted some hardwood suitable for turning and that it had to be well seasoned. To me, at that time, it all looked alike, but after buying lots of useless pieces, I soon formed my own opinion about turning requirements; perhaps you learn a lot quicker by your mistakes. I certainly did. One big advantage of woodturning is that we need not have the wood prepared for us, and all sorts of off-cuts can be put to good use.

Practically any hardwood is suitable for turning, in particular maple, sycamore, walnut, beech, oak or any other hardwood with close and beautiful grain.

Walnut is, perhaps, one of the most used timbers in turning as it answers all the necessary requirements in appearance and texture, and it is sweet to turn and easy to polish. A simple wax polish will quickly give a really beautiful finish.

Oak, on the other hand, can be quite tricky to handle and the various species vary a lot in texture. American oak works and finishes well, but the pinkish colouring is sometimes difficult to match up. English oak is very hard and finishes well but sometimes it is rather open grained and requires quite a lot of filling. It lends itself very well to fuming with ammonia, but it is difficult to colour with some stains. In my opinion, water stain is the most effective. If a rich brown tint is required (I call it church brown), then

immerse the turning in a bowl of strong caustic soda for twenty-four hours, and it will come out looking 200 years old!

Sycamore, beech and maple all turn very well, with lovely long shavings coming away from your gouge and chisel. Sycamore and beech will probably require staining as they are so light in colour, but maple is best left natural.

You may have timber offered to you which has been kiln dried; that is, the timber is cut to different thicknesses and stacked in a heated room, for a predetermined period, the object being to drive out the moisture and sap by prolonged gradual heat. From time to time the timber in the kiln is checked for moisture content, and when it has dropped to the desired level, the wood is removed and stacked outside in the air. Some kilns are not operated properly and the wood is spoiled, although externally the wood appears to be all right. However, in cutting into a 2 in. square, for example, you will probably find quite large splits right in the centre of the wood.

For this reason, I prefer to use air-dried timber and although the seasoning period is much longer, the resultant planks of wood are much better. For air drying, the tree is cut up into suitable planks and stacked one above the other, with small sticks in between each plank to allow for air circulation. The drying period is reckoned as being approximately twelve months per inch of thickness, thus a 3 in. plank would take three years. This period can be reduced, if the planks of wood are cut to nearly finishing size, that is, in 2 or 3 in. squares, or 7×1 in. boards. When the boards are cut into squares, they are usually stacked in short lengths and these are most suitable for turning table legs, etc. Each stack of squares usually carries the date it was cut up, so it is quite easy to tell when it is properly seasoned. In this case, you can reckon on six months per inch for seasoning time.

To prevent splitting and end shakes during seasoning,

the ends of the wood should be painted with tar or wax. I hope this will give you some idea of what to do if you have some freshly sawn timbers of your own to store.

Wet or green timber is much cheaper to buy than that which is already seasoned. Whether or not the piece of wood is fit to be used can usually be determined by its weight and touch. Green timber is heavy for its size and very cold to touch. When buying your wood seasoned, be on the look out for splits on the end, and if there are any this portion should be cut away before you start to turn.

Another thing to look out for is woodworm. This beetle attacks only the sap wood and its presence can soon be seen by the tell-tale holes. You can quite easily recognize the sap wood as its colour is much lighter than that of the rest of the wood. If you have any wood in your shed with woodworm, put it on the fire, as, doubtless you know, this small insect will get into everything else. For this reason, I prefer not to carry too large a stock of timber.

Walnut, although one of the most beautiful of woods, is a very wasteful one to buy, and demands very careful inspection, for the following reason. Walnut trees like a great deal of moisture and running up the centre of the tree is a small hollow tube. This goes all the way to the top of the tree and up every branch, so wherever you cut through the tree, you will see this small pipeline, about the size of a pencil. For this reason, alone, walnut can be extremely wasteful, particularly if you buy a plank that is out of the centre of the tree. I prefer to buy those which are cut about three inches from the centre. As the walnut seasons, splits will radiate from the pipeline, thus making a large area in the centre of the tree quite useless. So, before you buy up all the walnut in your neighbourhood, look very closely at it.

Elm is another wood which looks well and turns reasonably although the grain will require filling to get a good finish. This wood also has a nasty fault. Some boards,

upon inspection, will show a whitish-grey streak in places. This is a very hard gritty substance and will take the edge off all your tools in next to no time. How it gets there, I do not know.

Old table and chair legs can usually be picked up quite cheaply from junk shops and can be turned into some very useful items, but be on the look out for old nails, etc.

If you have a window facing the sun in your shed, keep your stock of timber away from it. Sun will ruin any wood that is underseasoned. Always stack your timber in the shade in a good current of air if you want to avoid splits and shakes.

Short-grained wood should be avoided, if possible. It is quite easily recognizable by the grain running diagonally across the sawn board. For some forms of carpentry this would not matter a lot, but when an article is turned, the grain must run lengthwise reasonably straight, or otherwise the finished article will be weak and easily broken. Also, it will not retain its original shape (see Fig. 20).

The wood required for bowls must be carefully chosen. If the plank of wood you are using was cut from the centre of the tree, then cut your disc of wood from the portion between centre of plank and outside. Avoid using the portion which is the centre of the tree. The bowl is then shaped on the lathe so that the contours of the bowl follow the curvature of the annular rings. Similarly, if a really large bowl is required, then pick a plank which was cut from between centre of the tree and the outside (see Fig. 21) and shape your bowl as before, with the grain of the wood following the shape of the bowl.

Quite often you can purchase ready-cut discs of wood for bowl turning, and the beginner can find it quite a problem to decide which side of the block of wood is to be the outside of the bowl. Take the disc of wood in your hands and, upon inspection, you will notice the annular rings in the end grain. From the shape of these rings, it is an easy

matter to determine just whereabout in the tree the block of wood came from. Try and visualize which side of the block of wood was nearest to the centre of the tree and that

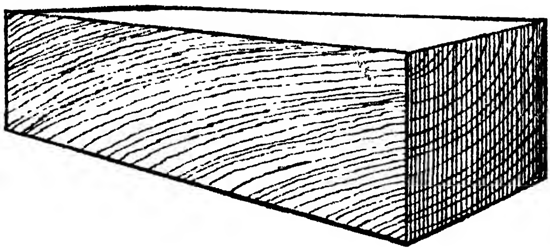


Figure 20. Short grained timber.

will be the side to be hollowed out and will be turned last, using normal methods of bowl turning.

From time to time you may be called upon to make circular table tops, or bases for floor standard lamps. These may be anything from 12 in. in diameter. In these projects, do not attempt to turn them out of one large piece

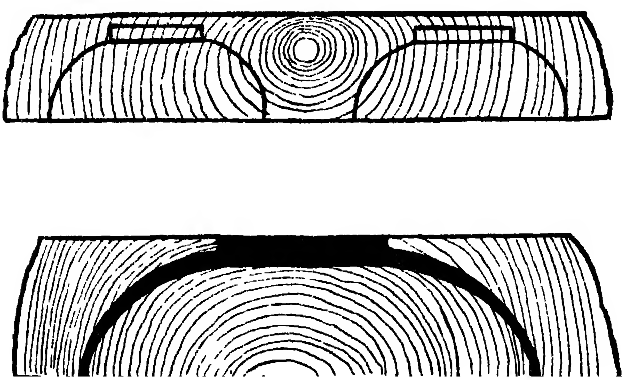


Figure 21. Method of cutting out bowls to prevent warping and splitting.

of wood. It is much better to make the required size out of two or three pieces glued together. The chances of twisting and warping are reduced to a minimum.

I mentioned in the chapter on faceplate work about turning bowls in wet or green wood. This is also possible for other types of work where you wish to dry the wood out quickly. Turn your article to within about $\frac{1}{2}$ in. of the finished size, allowing for subsequent twisting during the drying period. After rough turning, it should be put in a hammock of wire netting, hung in an airy position but away from direct sunlight.

Timbers from hot climates, such as mahogany and agba, very often have what is called thunder shakes. It is a very common occurrence in trees of large diameter grown in tropical climates. These thunder shakes are recognizable by short, irregular and broken lines running across the grain of the wood. The sections of timber with this fault are quite useless, except for the turning of small articles, as there is no strength in the wood.

The timber yard and the junk shop are not the only sources for finding suitable wood for turning. I have found very useful lengths of hardwood when I have been walking along the seashore after a good winter gale.

Softwoods are not generally accepted as being suitable for turning but some species of pine will produce very attractive articles, particularly Columbian and pitch pine. To turn these woods, you will require very sharp tools.

When we inquire at the timber yard for the price of certain species of wood, we are usually quoted the price as per cubic foot and this can be quite misleading, particularly if it is to be 3 in. square stuff. If, for example, a piece of wood is quoted at 12*s* per cubic foot, that means a piece 12 in. long, 12 in. wide and 12 in. deep. Therefore, a piece 12 in. $\times$ 1 in. will cost 1*s* per foot or $\frac{1}{12}$ of the cubic foot, or one penny per square inch per foot. Now, the 3 in. square material you are interested in will cost ninepence per foot

run. It is quite easy then to work out the price, if you divide 144 into the price per cubic foot of the timber. This will give you the cost per square inch per foot. It is then simple to work out the price for any size by working out how many square inches there are in the required cross-section.

CHAPTER THIRTEEN

Woodturning design

Basic principles and rules – traditional and contemporary – Laminated work – Designs for table lamps, chandeliers, wall lamps, bowls, laminated bowls, egg cups, cake stands, lamp standards, etc.

DESIGN in woodturning, as in any other art, falls into two categories, contemporary and traditional. The former, as applied to turning, is very simple indeed, consisting chiefly of straight taper turning, and it is to be seen in this form in many articles of furniture today. Very little experience is required to turn out such articles, although some forms are more pleasing than others. On the other hand, traditional design gives more chance for the amateur craftsman to express himself and consequently, will give more satisfaction. It is well to study and admire some of the styles and forms in antique furniture design when making your own designs for table legs, lamps and candlesticks. For example, take a look at work by Sheraton, *circa* 1805 or English Jacobean, *circa* 1650, and you will see some fine woodturning, the basic design being used in furniture today.

Many of the American Colonial craftsmen used these classic forms to produce their own design. After the Industrial Revolution, many of the early craftsmen went into decline but it is true to say that we still rely on these old craftsmen for the best forms in woodturning. If we look farther back in history to Greece or the ancient Roman Empire, we shall again see classic forms in stone which can be easily translated into wood. The amateur would do well to study these old works of art.

If we analyse any turnings, we find that they are made up of very few basic forms. There is the convex curve, known as a 'bead', 'ovolo' or 'toros', and the concave curve, which in the shallow form is called 'cavetto', or a 'scotia' for the deeper form. If we wish to change design abruptly from a convex curve to a concave, it is the usual practice to turn a small step or 'fillet'. A combination, consisting of a convex and concave curve, without a 'fillet' between is commonly called an 'Ogee'.

All traditional designs are made up of a combination of these basic forms, although some of them with the curves elongated, distorted or flattened. The craftsman would do well to study these designs before embarking on his own originality. In all designs, crispness in outline is most important; do not slur or run different parts together. A small fillet, slightly slanted, will give the design a certain amount of sharpness. On the other hand, do not have too many different shapes in your design, otherwise it will appear too ornate. A standard lamp, for example, looks much better if the upper portion is reasonably plain, with the ornate turning near the base.

When designing table and standard lamps, make them appear, quite definitely, to be standing on their own bases. Do not make them look top heavy. Before embarking on any project, study the grain of the wood which you propose to use. Timbers with beautiful strong grain markings, such as walnut, can be absolutely spoilt by too many different elements of design. In such cases try to bring about a shape which will enhance the natural beauty of the wood. Contemporary designs are well suited for strong grained timbers, the plainness in design being made more attractive by the grain in the wood. When making tapered contemporary table legs, do not make the taper absolutely straight, allow a certain amount of fullness at the midsection.

Some craftsmen will find it very difficult to obtain large quantities of exotic timbers, but where supplies are limited,

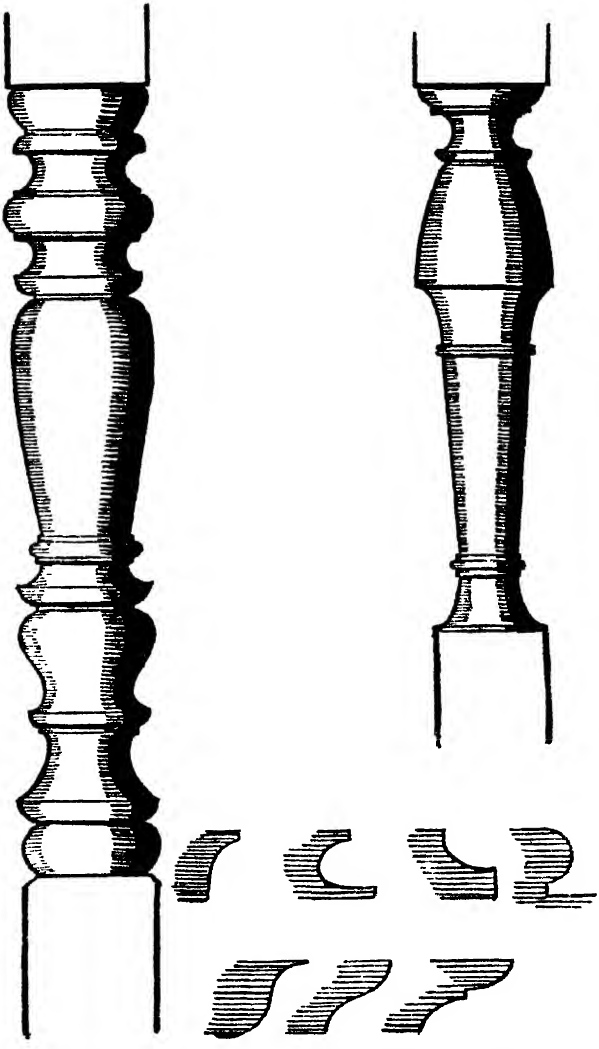


Figure 22. Elements of traditional design.

laminated or built-up turnings can be made, which helps a little to go a long way. Furthermore, it is a very good way of using up off-cuts from other work. It is a very good idea to offer to buy off-cuts from your local timber yard as they come in very useful and can be bought quite cheaply.

There are three general classes of built-up work:

1. Laminated, which consists of several layers of wood arranged sandwich fashion and glued together.
2. Segments, where the pieces of wood are all cut at an angle and arranged radially to form a solid block of wood.
3. Post blocked, where you start with a square centre core of wood and glue other pieces to the sides until the required size is built up.

Work of this type requires well-seasoned wood and perfect glue joints. The wood should be selected for its colour and hardness, alternating contrasting timbers. For example, walnut and sycamore look very well together. The woods used should have the same hardness and texture. Avoid using softwoods and hardwoods together.

With all laminated work the choice of glue is most important. The old hot scotch glue is not to be recommended as it tends to be too brittle, particularly when actually turning. The most satisfactory glues appear to be the synthetic resin types, with or without separate hardeners. These glues do not rely on the air for their drying; this is brought about by chemical action. Contact adhesives have been suggested, but again, these have their bad points. Firstly, the two pieces to be joined must be correctly positioned when they are brought together, as there is no moving them when they have made contact. Secondly, this type of glue never sets rock hard, consequently after turning and sanding a bowl, for example, you will still be able to feel the joints in the wood. This is due to the rate of expansion and contraction of the different timbers being

unequal, and the semi-plastic nature of the glue allowing movement.

Laminated work is the simplest of the built-up form. All it calls for is that the various pieces be perfectly flat for perfect adhesion. It is the usual practice in sandwich construction, to place the grain of each layer at right angles to the piece below it. This will give the article strength and prevent warping, particularly as this type of work is very suitable for turning bowls. Turning effort can be saved on a large bowl, if various rings are roughly bandsawn to shape before gluing up.

This form of lamination work can be varied by gluing lengths of timber side by side using contrasting woods. The lengths of wood should be planed on all sides to a uniform width, before sticking together. When the glue is set, the block of wood thus formed is bandsawn into discs. Some very attractive bowls can be made in this way as shown in plate 4.

If your supply of contrasting woods is limited, the following method will make a little go a long way. Take a 2 or 3 in. block of wood, about 9 in. square, preferably in sycamore or maple. With a compass draw a 9 in. diameter circle on the face side of the wood; keeping the compass set at the radius of the circle, mark off six points on the circumference—the radius of any circle will divide the circumference into equal parts. Connect up all the points and cut along the lines with tenon saw or bandsaw. You will now have a perfect six-sided block of wood. It is essential that care is taken in the sawing, so that all six sides are perfectly flat and square with the face side of the block of wood. If you have a sanding disc fitted to your lathe, the sides of the block can be finished much more accurately. The next stage is to take a piece of contrasting wood, preferably walnut or rosewood about 1 in. thick and the same width as the block of sycamore is thick. Plane and sand perfectly flat on one side only, and cut up into six

separate pieces, each piece being the same length as the flats on the block of wood. Using a good glue, stick these pieces of walnut, planed side, on the six sides of the block. When the glue is well set, bandsaw to a circle, using the previously marked centre of the block to describe the circle. Then turn in the usual way using very sharp tools. The sharpness of the tools is important if the joints in the block of wood are to remain unseen. This same method can be used for any number of sides you wish to mark out on the basic block of wood, but too many will look over ornate. All laminated work can be very attractive providing it is not over decorative.

Segmented work is a little more difficult to set up as it requires great accuracy in cutting out and can be simplified if you have a circular saw fitted with a meter attachment, but all amateurs may not have this luxury. This type of work, is also, most suitable for bowl turning. The first step is to decide how many segments you are going to have, and perhaps for your first effort, I would suggest no more than twelve. Now a full circle is 360 degrees, so if you are going to divide this up into twelve equal portions, then each segment will have an angle of 30 degrees, measured at the centre of the circle. By the same reasoning, if we are to have eighteen segments, then these will have to be cut at 20 degrees. Cut the segments out of 1 in. thick contrasting timbers, glue and arrange to form a circle. It may be necessary to tie some string lightly around the outside to keep the pieces in position, or alternatively, make a wooden jig, to do the same thing. It is a good idea to make this first disc up on an old piece of newspaper to prevent your block of wood and the workbench becoming all one piece! When the glue is set, sand flat on both sides. A further set of segments can be glued on top of the first, but staggering the position of the joints and contrasting timbers. Repeat the process until the desired depth of block has been obtained. This method forms a solid block and a lot of

wood can be saved if the second and subsequent layers are in the form of segmented rings. Measure the width of the segments on the first layer and cut twelve separate

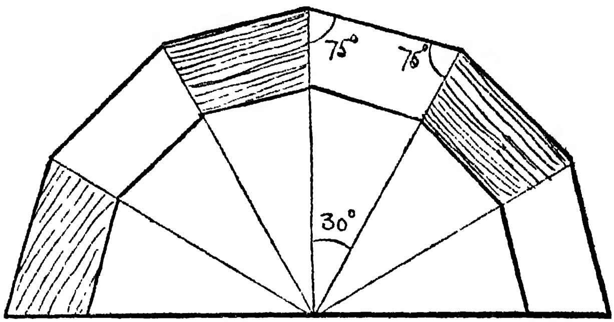


Figure 23. Cutting angles for laminated twelve sided bowl.

portions, the ends of which are mitred at 75 degrees as shown in figure 23. The angles at which segments must be cut for other numbers of sides are as follows:

No. of sides	*Mitre angles degrees*	*Angle at centre of work degrees*
6	60	60
8	67·5	45
10	72	36
12	75	30
18	80	20

With practice many variations of this type of work can be accomplished. Although very fascinating, this branch of turning is not a very popular commercial proposition, owing to the amount of time spent in setting up, and unless extreme care is taken, it can look very much the work of an amateur.

Next in simplicity to sandwich lamination is the post blocked form. As the word implies, the centre form is a

square post of wood, with contrasting woods and veneers glued around it. This type of laminated work is very suitable for the production of table lamps and gives a most attractive appearance, although again, as a money making proposition, where time is limited, the amateur would do well not to make the build up too complicated.

The preparation of the centre core is the first step. This should be a length of wood, absolutely square and planed on all four sides. Diagonal lines are marked on the ends of the wood to determine the true centres. This core should then be placed on the lathe between centres, and the tailstock adjusted to lightly hold the piece of wood. With the lathe turning at medium speed, make a light cut with the parting tool, at each end of the wood. Stop the lathe and check the cut made with the parting tool to see that all four corners have been cut the same amount; if not, reposition the work between centres so that an even cut is taken on all four corners.

Another method in obtaining the perfect centre, is to remove the wood from the lathe after the first cut, plane off the off-centre sides so that the parting tool cuts are equal on all four corners. If the work is not properly centred at this stage, the finished piece will have an out of balance design.

The next step is to choose some suitable contrasting wood and cut into strips about ½ in. thick, planed flat on both sides. Two of these strips are then glued to two opposite sides of the basic block making them slightly wider than the block of wood. When the glue is set, lightly plane the edges of these strips so that they are flush with the sides of the block.

A second pair of strips is then applied to the other sides of the block, the sides slightly overhanging. When set, lightly plane flush with the remainder of the block, retaining the true squareness of the original block. The build up proceeds in this manner until the required size of block is

built up, always fixing one pair of sides at a time. No attempt should be made to speed up the work as this will only result in bad joints and a lop-sided looking table lamp —if lamps are to be the project. According to the design you have in mind, you may not find it necessary to build up the block the same size for the whole of its length. Only build up the portions which you require to turn, to the required size. There is no need to waste time in building up portions which will be cut away in the subsequent turning operation.

As in all forms of built-up work, the woods used should be of uniform hardness to avoid flats when sanding. Do not spoil the design by using too many pieces of wood.

With all laminated work, it is usual to use some very light woods mixed in with others which are extremely dark and this can present a problem in the finishing stages. If you are not careful in the sanding process, it is quite easy to embed particles of the darker wood into the lighter portions. Use very fine sand paper with not too much pressure. The surface of the wood should then be sealed with clear french polish. Allow this to dry and smooth down with a further rub with flour paper. This is the finest grade of sand paper. Finally polish with another coat of clear french polish and canauba wax.

Having now covered most of the basic types of woodturning and also some of the more unusual aspects of it, you are probably wondering where to go next. No doubt you have spent quite a lot of time and money with your equipment and want to get into production and make the machinery pay for itself.

The first saleable articles are always a thrill and achievement. In an earlier chapter, I told you how to make a table lamp base. This was to get you to use your tools properly, so now let us get into this woodturning business properly.

Table lamps are always popular and can be turned and

polished without being removed from the lathe. If you are not too sure of designing one yourself, take a look round at some pottery articles. A lot of them are quite suitable for copying in wood. The first requirements will be blocks of wood from 6 in. to 8 in. long and about 5 in. square. In some parts of the country it is possible to purchase specially prepared blocks of wood used in the manufacture of skittles. These save a lot of time, if you can get hold of them, as they are usually trued up and have the corners taken off so that the block is an octagonal form.

Plate 14 shows some designs for table lamps. Mount the block of hardwood between centres on your lathe, using for preference, a four-prong driving centre. The centres on the wood should previously have been marked out in the usual way. Check, by rotating your lathe by hand, that the work is running true, then bring up the tailstock so that it is at a suitable height—just above the centre line of the work. Tighten and lock the tailstock. Using the $\frac{3}{8}$ in. gouge, turn to the desired shape, at a speed of 1,400 r.p.m., remembering always, to cut from the larger diameter to the smaller. Take up the parting tool and true off the base of the lamp, if anything, making it slightly concave. This will ensure that the base will rest flat on the table. When trueing the base with the parting tool, it will only be possible to cut the wood away up as far as the driving centre, thus leaving a short pin or tenon. Do not worry about this, as it will be taken out in the boring operation.

The end of the lamp at the tailstock end should be trued up either with the point of a skew chisel or using the $\frac{3}{8}$ in. gouge to obtain a nice smooth finish. Stop the lathe now at this stage, and inspect the work for any flaws in the wood and, if necessary, fill these with plastic wood if they are very deep, and allow to dry. I am not really in favour of using plastic wood at all, as it is difficult to camouflage in the finishing process, but sometimes it cannot be helped.

Now comes the finishing process, so remove your tool

rest or slide it along the bed out of the way. With the lathe turning at a faster speed of about 2,000 r.p.m., sand the surface of the lamp, using a medium grade paper followed by a fine one. Now take a block of pure beeswax and whilst the lathe is rotating, press this into the work, thus depositing a thin layer of beeswax over the entire project. This is rubbed in using a well worn piece of medium grade sand paper. The wax will be forced into the grain of the wood, together with some of the sandings, thus making a perfectly coloured sealer, no matter what wood you are using, except for the paler woods such as sycamore, beech or maple, which will require a different technique. For these woods do not apply beeswax as a filler as it will give a yellowish finish. Being very close grained, a sealer only will be required. For the sealing, apply a coat of clear french polish with a pad, replenishing it as soon as it becomes dry. The speed of the revolving work will dry the polish, more or less, as soon as it is applied. Work progressively from one end of the work to the other and gradually a reasonable shine will be produced.

If preferred, the french polish can be built up to provide the finished surface. A little linseed oil applied to the pad with the tip of the finger will prevent the pad from sticking. The only disadvantage of the french polish finish on its own, is that it is not scratchproof and if you are supplying table lamps to the trade, this is quite a serious fault. I have found that carnauba wax finish is to be preferred. Assuming then, that our final finish is to be carnauba wax and that the sealer coat has been worked up to a fair shine, apply a stick of carnauba wax lightly to the whole of the work, the lathe still revolving at 2,000 r.p.m. Only a light film of this wax is required. If you apply too much the finish will be brittle. The wax is spread over the whole of the work with a piece of lintless rag, using only a light pressure. Here now, is the tricky piece; too much pressure will remove the carnauba wax completely; too little, and it will look as if it has been out in the frost. A little practice will soon give you the

correct pressure. If the polishing rag is applied with the index finger, the frictional heat will be felt and that will be the indication whether or not too much pressure is being applied.

Stop the lathe and remove the work. It will be quite fit to handle as the carnauba wax sets very quickly and is non-sticky to the touch. Remove the driving centre from the lathe and replace with a three-jaw drill chuck. Using a $1\frac{1}{4}$ in. centre bit mounted in the chuck, and with the lathe rotating at 1,000 r.p.m., drill out the bottom of the table lamp to a depth of 1 in., to remove the unturned piece in the centre of the base, and also, to enable the $\frac{1}{4}$ in. flex hole which will be bored horizontally in the base, to meet the vertical hole to the lampholder. The boring method is quite simple. Holding the wood firmly in the left hand, lightly press on to the tail-stock centre, at the same time advance it on to the drill point with the tailstock feed. Remove the $1\frac{1}{4}$ in. centre bit and replace with a wood drill of $\frac{5}{16}$ in. diameter. Bore out the centre hole first from the top of the lamp base, using the tailstock held into the base of the lamp, then reverse the wood and drill the other end. Both holes should meet up perfectly if you do not force the drill to cut. This method is quite suitable for drilling this length of wood, although if preferred, the long-hole boring attachment can be used. The last stage in drilling, is to bore the $\frac{1}{4}$ in. hole in the side of the base to take the flex into the lamp. All that remains now, is to fit a brass nipple to take the lamp holder. These are made with a $\frac{1}{2}$ in. metal screwed thread at one end and the other end with a $\frac{3}{8}$ in. woodscrew thread which will screw nicely into the $\frac{5}{16}$ in. hole drilled through the lamp.

Although this description may make lamp base making appear a lengthy process, in actual fact you should be able to make one finished lamp in well under 20 minutes. If you propose making several lamps of similar shape, you will find it beneficial to manufacture them in stages; that is,

turn them all first, sand and seal all, then finish them and finally drill.

To get the most out of your lathe, aim at doing as much work as possible with the particular tool you are using. It is a waste of time to keep changing from tools to polishing to boring and then back again for the next item.

Another type of table lamp is the table standard type (plate 14). This consists of a separate pillar and base. For the pillar, you will require a 10 in. piece of wood, 2 in. to $2\frac{1}{2}$ in. square, and a 6 in. disc of wood, about 1 in. thick for the base. Turn the pillar between centres at a speed of 2,000 r.p.m., as in the case of the stool leg, but turning a 1 in. diameter pin or tenon at the driving centre end of the work. A pair of callipers will come in useful here. Set them to exactly 1 in. diameter. This type of lamp is suitable for a contemporary design and turning is reduced to a minimum, a straight taper being all that is required, commencing with the widest part of the pillar which should be at the tail-stock end. The wood should be first roughed to shape with a $\frac{3}{4}$ in. gouge and finished off with the skew chisel to a maximum diameter of 2 in. at the top, tapered to about $1\frac{1}{4}$ in. at the base. The 1 in. diameter pin at the base of the pillar should be about $\frac{3}{4}$ in. long. In any projects consisting of several parts, it is as well to finish each part separately on the lathe, as it may prove to be difficult once the various parts are assembled.

Having turned and finished the pillar, except for boring, take it out of the lathe and remove the pronged driving centre. Screw a $2\frac{1}{2}$ in. diameter woodscrew chuck on to the mandrel. Bore a small hole with a bradawl in the centre of the 6 in. diameter base block and mount on to the woodscrew chuck. Using the $\frac{3}{8}$ in. gouge on its side and with the tool rest as close to the work as possible, true the block to a perfect circle. Try not to damage the fibres of the wood in this operation. If you are using the gouge correctly, this should not present any problems. Scraper tools could be

used but if you are not careful, they will give you a rough finish which will be difficult to remove with sand paper. With regard to the general shape of the base, this will depend on whether your project is to be traditional or contemporary. For the latter, a plain disc is all that is needed, whereas for the traditional, just a little shape will give the desired effect. Do not make it too ornate. With the point of a skew chisel, make a small mark in the centre of the work, to give a centre for boring a 1 in. diameter hole in the base. Sand, seal and polish the base, using the same method as in the other table lamp. Remove the woodscrew chuck and base and mount the three-jaw chuck in the mandrel. Drill a 1 in. diameter hole in the base using the tailstock with a drill pad, consisting of a block of wood with a hole in it, to fit over the nose of the tailstock spindle. The base is held on to the drill pad and advanced on to the rotating drill by means of the tailstock feed. Finally drill a $\frac{5}{16}$ in. diameter hole through the pillar and a $\frac{1}{4}$ in. flex hole through the side of the base, and glue the pillar into the base.

Another simple but effective small table lamp is in the form of a candlestick. This is made entirely using the woodscrew chuck and uses up a number of odd waste pieces of wood. A 6 in. $\times$ 1 in. disc is turned to shape as previously described, the inside being shaped like a deep saucer; a 1 in. diameter hole being bored through the centre to take the small centre stem. For the stem and handle, mount a piece of wood 2 in. square and 4 in. long, centrally on the woodscrew chuck, the ends of the block having been previously cut square. Bring up the tailstock with a plain centre inserted to support the wood during the roughing out stage. With the lathe turning at 2,000 r.p.m. turn the block to a true cylinder, being careful not to touch the rotating chuck. A 1 in. portion can be left unturned at this end as it will be waste. Having smoothed the block remove the tailstock and remount it in the three-jaw chuck with a

$1\frac{1}{4}$ in. centre bit. Bore a short hole in the end of the wood to a depth of about $\frac{1}{2}$ in. Using a $\frac{3}{8}$ in. gouge and small skew chisel, shape the portion to form a ring, and part off, using the parting tool, after sanding and polishing this small section. This ring is to be the handle of the candlestick. The remainder is shaped to form a short pillar with a 1 in. diameter pin at the chuck end. The shape need not be anything spectacular but try and make it a little ornamental. Sand and polish as before. With the wood still rotating, bore a $\frac{5}{16}$ in. hole down the centre using the tailstock mounted drill chuck and being very careful not to foul the point of the woodscrew in the chuck. Finally, with the drill mounted in the mandrel bore a $\frac{1}{4}$ in. diameter flex hole in the base.

Assembly is very simple, the short pillar being stuck into the base and the wooden ring being either stuck to the base or screwed from underneath.

All of these lamp projects can be completed in a very short time and although I have covered only three basic designs, they can all be varied to the craftsman's choice.

Many wooden articles only call for turning as part of the finished product and it is in this aspect that the lathe is very useful. After using a lathe for some time, you will soon appreciate the use of a bandsaw or jig saw, to widen the variety of your work. The following projects have most of the parts turned and the remainder cut out with bandsaw or fretsaw. Wall lamp brackets and chandeliers fall into this category, although the whole project could be turned throughout with slight alteration in design. Most turned articles usually create a large amount of waste wood, both in the initial cutting and also the subsequent turning. The latter, of course, cannot be avoided, but it is well to spend a certain amount of time in setting out the designs on the wood, so that there will be a minimum of wastage. The wall bracket parts can all be cut from one 6 in. × 1 in. board,

preferably planed beforehand, as shown in figure 24. Marked out as shown, you can cut a number of arms and three sizes of discs, i.e. 5 in. diameter, 3½ in. diameter and 2½ in. diameter, all of which can be used either for brackets or chandeliers. I do not propose to go into any detail of methods of turning or boring, as this should be understood

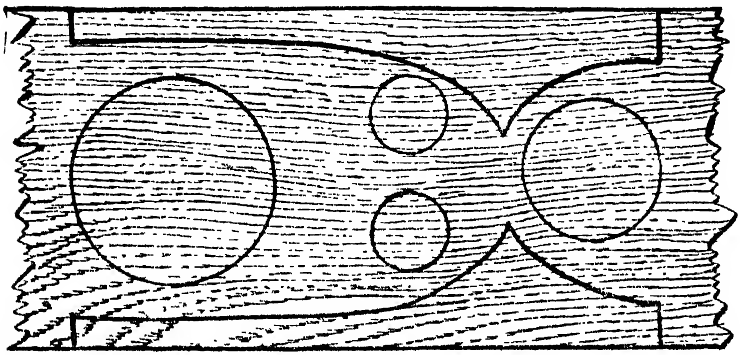


Figure 24. Method of marking out wood for wall brackets etc.

if you have followed my earlier chapters. The general procedure is the purpose of the following.

The first stage, after cutting out is to turn the 5 in. and the 3½ in. diameter pieces to the shape shown, using a woodscrew chuck and a ⅜ in. gouge. The large disc will form the back plate to the bracket and the 3½ in. diameter piece is sawn into two equal parts. The smaller discs are turned to form cups for the lampholders and a support for imitation candle drips. To turn the cups, first of all shape the undersides and sand, making a hole in the centre with a bradawl whilst the work is rotating. Stop the lathe, and reverse the position of the cup and hollow out the centre, being careful not to touch the woodscrew holding the work. For small items such as these, you will need only about ⅜ in. of the woodscrew, so, unless your woodscrew chuck has an adjustable centre screw, use a piece of hardboard as a packing piece. Drill a

$\frac{5}{16}$ in. hole in the centre of each cup to take a brass pillar nipple, which will extend through the cup by about $\frac{1}{4}$ in. All parts should be well sanded whilst on the lathe, but it is not necessary to polish at this stage.

The arms are next drilled, first with a short vertical $\frac{5}{16}$ in. diameter hole, about an inch from the end of the deepest portions and a long $\frac{5}{16}$ in. diameter hole running through the centre of the arm to meet up with the vertical hole. This may seem a little difficult but if a parrot nosed bit is used for this operation, and the arm is fed on to the drill using the tailstock, you will have no trouble. Alternatively, make a small table which can be supported in the tool rest holder and used as a drilling jig. Finally, drill a $\frac{3}{8}$ in. diameter hole in the centre of the back plate.

The method of assembly is very simple and is the same for either single or double arm brackets. The arm is just screwed and glued centrally on one of the half circles of wood. In the case of a two-arm bracket, these are screwed at 90 degrees to each other on the half circle. Then screw this assembly to the back plate so that the arms are central on it. The other turned half of wood is mounted on top of the arms, being screwed in position from behind the back plate. Thread in the flex and screw on the lampholder cups to the end of the arms, using the extended portion of the pillar nipple as the holding device. All that remains is to screw a small brass mirror plate to the back of the wall lamp for fixing purposes.

The chandeliers or pendants are constructed in a very similar way using identical parts to the wall brackets, with the exception of the centre pillar. The first operation is to turn a centre pillar from a piece of $2\frac{1}{2}$ in. square wood, about 10 in. long. Turn between centres to either a traditional or contemporary design in the same manner as in the table standard; as a matter of fact, this lamp part can be used for the pillar! A 1 in. diameter pin is turned at one end. Bore a $\frac{3}{8}$ in. diameter hole through the pillar either free-hand

or using the long boring attachment. Enlarge the hole at the top of the pillar to take a $\frac{1}{2}$ in. male hook, as pendant hooks are called. Two 5 in. diameter pieces are then turned on the woodscrew chuck to the same shape as the back plates of the wall brackets and a 1 in. diameter hole bored in the centre of each.

Next turn a 3 in. plain wooden disc, 1 in. thick or to the thickness of the arms, again bore a 1 in. diameter hole in the centre of this piece. In the sides of this disc, bore three holes, $\frac{3}{8}$ in. diameter, spaced at an angle of 120 degrees to each other for a three-arm pendant, or at 90 degrees to each other for a four-arm pendant. The arms, which should be about 8 in. long overall, are drilled in the same manner as before. The lampholder cups are turned and bored, to the same pattern as in the wall brackets.

The method of assembly is quite straightforward. First, the 3 in. plain disc of wood is screwed centrally to the back of one of the 5 in. pieces, and the arms screwed to this in such a way that the long holes in the arms mate up with the side holes in the 3 in. centre disc. On top of this assembly is screwed the other 5 in. piece, these screw holes being as close as possible to the 1 in. diameter hole already bored. The pillar is then glued into this assembly. Thread in the flex to each arm and through the centre pillar and connect them all in parallel with small connectors in the centre of the assembly. Finally screw on the lampholder cups at the ends of the arms. To complete the pendant, a small knob is turned with a short 1 in. diameter pin, which will fit into the base of the pendant, thus concealing the wire connexions and fixing screws.

The usual height of a floor lamp standard is about 5 ft., and it is, perhaps, one of the largest single turned items which the amateur will be called upon to turn. As the distance between centres of most lathes is 30 in., the pillar for these has to be turned in two sections, each being 30 in. long. The timber used should not be less than $2\frac{1}{2}$ in. square

and it should have good straight grain and be clear of knots. Avoid using timber with what is called short grain, that is, with the grain running diagonally across the piece of wood, as this would cause the finished product to warp and twist.

Most lamp standards are used in a warm room, often quite close to the fireplace, so the wood must also be well seasoned. The portions for the pillar are turned in the normal manner between centres and each will have a 1 in. diameter pin or tenon turned on one end. In setting out your design aim at having most of the intricate turning on the lower half (see plate 14). This piece should be of fairly solid proportions and tapering. The upper half should be reasonably plain, except for a little design at the very top, to take the lampholder. If the work shows any sign of ridging or vibrating, a steady rest will have to be used to support the work whilst turning. Perhaps by now you have plucked up enough courage to steady the work with the palm of the left hand, whilst turning the work single handed with the other. It is surprising how easy it is when you have the knack! When each portion has been turned, it should be sanded and polished whilst still on the lathe, using either wax, french polish, carnauba method or straightforward french polishing. Bore out the centre holes using the long hole boring method as already described.

The next item is to make up a 14 in. diameter base of three pieces, each 14 in. $\times$ 5 in. and about $1\frac{1}{2}$ in. thick. The pieces are planed square on the edges and then glued together, using a synthetic glue. Mark out a 14 in. diameter circle with a compass and cut roughly to shape with a handsaw or bandsaw. Mount the disc on a woodscrew chuck and flatten off the base, using either a $\frac{3}{4}$ in. half round gouge or scraping tools. Turn a slight recess in the centre to take the normal faceplate. Remove the base from the woodscrew chuck and remount on to the faceplate with four woodscrews, using the turned recess to mount the faceplate. Shape the base using the $\frac{3}{8}$ in. gouge and scraper tools,

with the lathe running at its slowest speed of about 450 r.p.m. With the lathe still rotating, bore a 1 in. diameter hole in the centre to take the vertical pillar. This hole can be bored out using the point of a skew chisel but I prefer to hold a three-jaw chuck in my hand and just push.

The base can then be sanded and polished. All that is required now to finish the base is three small turned feet about 2 in. in diameter and 1 in. thick. These can be turned on the woodscrew chuck, or by placing a short length of wood between centres and turning the three small discs out of one piece of wood. When turned they are partly cut off with the parting tool and finally sawn off. These are then screwed at equal distances around the underside of the base. The whole assembly is then glued together.

When assembling the two parts which form the centre column, try and arrange them so that the grain in each section matches as near as possible.

I have described the method using two separate portions for the centre column, but providing a suitable design is chosen, this could be made up of more separate sections, the joins of each being hidden by carefully positioned beads or fillets, the finished product having a continuous appearance. This is a good way of using up old table and chair legs which can often be bought very cheaply from old junk shops.

Many turned articles rely on a certain amount of ingenuity by the craftsman. For example, a powder bowl with a turned lid can be partly turned all in one peice. A block of wood, slightly deeper in section than the completed powder bowl, is mounted on the woodscrew chuck and turned to shape, including the portion for the lid. A groove, ½ in. wide and about ¼ in. deep is cut with the parting tool at the point where the lid joins the remainder of the bowl. The lid is now sanded and polished and a small hole made in the centre with a bradawl. Then cut it away from the remainder with the parting tool, leaving a small lip

which will locate the lid in the bowl. The bowl is then hollowed out in the conventional way, being careful to leave sufficient wood at the sides so that the lid will be a snug fit. The bowl is then polished inside and out.

Remove from the woodscrew chuck and mount the lid on it, the underside of which is turned slightly concave, and polished. Turn a small knob out of an odd contrasting piece of wood, with a small $\frac{3}{8}$ in. pin on the end of it. A short $\frac{3}{8}$ in. hole is drilled in the top of the lid and the knob glued in it.

Another item with which you can have difficulty is a wooden goblet. These usually have very narrow stems near the base and a large upper portion, which is hollowed out. In cases like this, turn the block, which should be mounted on a woodscrew chuck, to a cylinder, using the tailstock as additional support, if required. Hollow out the inside, using the parting tool and scrapers, to the desired internal dimensions. This must be turned first because if you try to do it after shaping the outside there will not be sufficient strength in the wood, particularly in the narrow section. Having hollowed and sanded the inside, the tailstock should be brought up to support the work, with a block of wood between the plain centre and the inside of the goblet. This will give ample support whilst the outside is being turned to shape. It is a good idea to have several small round blocks of wood for this purpose. Reproduction goblets are a favourite object for local antique dealers to ask for.

Cake stands make suitable gifts for your friends, particularly if they are turned in walnut or mahogany—just the thing to please your mother-in-law at Christmas! The principle of manufacture is quite straightforward. The base is first turned in the normal manner on the woodscrew chuck, using a 2 in. thick block about 4 in. in diameter. If you are not too certain of a suitable design, take a look around your local china shop and you will soon get the idea. Having

turned the base, sand and polish it, and drill a 1 in. diameter hole about ½ in. deep in the centre of the wood, the drill being held in the tailstock whilst the work is rotating. This will be the position which is to be joined to the upper plate. Remove this piece from the chuck and remount another disc of wood about 9 in. in diameter and 1½ in. thick. Turn the underside first, with a flat section in the centre which will mate up with the base piece. Whilst still rotating, bore a very shallow 1 in. diameter hole, about ¼ in. deep. Remove the bit and make a small hole with the bradawl in the centre of this 1 in. hole. Reverse the piece of wood on the woodscrew chuck and shape the top side, removing sufficient wood so that there is no trace of the previous woodscrew fixing. The two portions are then glued together using a short length of 1 in. dowel to centralize the two pieces.

To use up odd pieces of timber, there are always plenty of small articles which can be made, suitable for sale in gift shops. These include ash trays, small barrels to hold matches, barometer cases and cruet sets. You have all seen at the holiday resorts the assortment of little wooden articles fitted with small thermometers and egg timers. Although not works of art, they do use up the odd pieces of wood which would otherwise be put on the fire.

CHAPTER FOURTEEN

Treen

Antique reproduction of eating and drinking vessels

TREEN was the old term used to define objects made from a tree, but the word is only used now in connexion with antiques, although it is not meant to include items which are purely ornamental or artistic, also, they are not necessarily all turned items, but I shall only describe those that are proper to turning. If you have the chance to turn out an old attic or somebody's old shed, you could quite easily come across what appears to be a piece of old wood. Before you throw it on the fire, carefully inspect it, you may have found a real choice antique—a piece of treen.

It always had some useful purpose, although at times it was ornamental as well. Craftsmen took great pride in their work in those days. Relics are to be found which originated in the dining-room, the kitchen, the bedroom, the dairy and the workshop which points to the necessity for wooden articles in years gone by. Many genuine pieces found today are extremely valuable and it is no wonder that quite a trade has sprung up in the reproduction of these simple, attractive articles. Many of them were made out of sycamore, oak and in particular, yew, which has a beautiful grain. Most articles connected with the consumption and preparation of food and drink were made of the wood which was within every countryman's reach and which he could use at no expense to himself. These utensils include tankards, goblets and wassail bowls, in which punch was prepared.

Then there were wooden dishes and bowls, knives and forks for the serving of food, and wooden platters from

which the food was eaten. Cheeses were made in wooden moulds and butter rolled with wooden pats.

In a great many churches today, you will see treen in use as offertory plates, and collecting boxes.

Even the smoker, in the good old days had an article like an elongated egg cup for grinding his own snuff, and the winemaker had his set of wooden funnels. Collecting these original pieces is a very fascinating hobby, but should you wish to make your own, it is not a very difficult matter. Simplicity in design is one of the basic requirements. Remember, the old craftsman had the crudest of lathes and tools and we should be able to do, at least, as well as he did.

The articles should preferably be turned in yew, which has a very close grain and is easy to work. Originally these articles were left untreated, but through ageing, they have become very dark, attractive colours. To obtain an aged appearance, they should be stained, but not over-polished. All antique pieces of woodware develop what is called PATINA, or the appearance of old age. This is most difficult for the amateur to simulate without a lot of experience in antique reproduction. No antique dealer will tell you how to create patina. It is regarded as an infallible sign of age and is valued by collectors. It cannot be properly produced by the application of polish or varnish. It is only brought about by years of cleaning, polishing and rubbing and usually the upper portions of an article which catch the dust, have the finest patina. The best the turner can do is to stain the article with a fairly dark stain and french polish with a garnet polish. Articles for serving food must be left natural, with a light application of salad oil, well rubbed in.

Even spoons were turned and carved, and, I believe that even today in some parts of the country, young men make their sweethearts spoons during their courting days—hence the term 'spooning'. In years to come, I wonder if these spoons will be regarded as treen and prized by the collector.

Among treen not turned, we find such items as bird scarers, rat traps, policemen's rattles and nut crackers.

Perhaps I have been able to whet your appetite for this branch of the craft. If I have, it is now up to you to visit antique shops and see what you can find to start your collection.

CHAPTER FIFTEEN

Finishing

Principles and method – Sanding, steel wool, filling – Wax finishing methods and material – French polish method and materials – Cellulose process – Staining

WOOD finishing normally involves a considerable number of separate processes, all of which are quite an art in themselves, if perfection is aimed at. The two distinct aspects of quality in any wood finishing are appearance, which will be the chief factor if articles are to be saleable, and durability, which will have a great influence on the reputation of the craftsman. The first stage in finishing is sanding, of course, but do not get the idea that sand paper alone will give you a suitable surface for final polishing.

If the work has been turned badly, due to incorrect use of your tools, no amount of sanding will put matters right. I made a point in earlier chapters of asking you to use your gouges and chisels, so that the wood is cut and not chipped away, and if you find that you still have rough spots before sanding, try and remove them by taking a light cut with the gouge on its edge.

Our first stage will be to use a piece of medium grade sand paper, such as M2, folded double and held between fingers and thumb. Assuming that at the moment we are turning between centres, the sand paper is applied to the underside of the work, with palm upwards. If this method is used it is quite easy to let go of the sand paper and avoid having an accident with your fingers if anything should go wrong or you apply too much pressure. If, on the other hand, you apply the sand paper to the work palm downwards and on top of the lathe, there is the possibility, that should

you apply too much pressure to the work, your fingers will be trapped between the work and the tool rest, and that can be very unpleasant. These simple explanations will also apply whilst polishing or using steel wool.

The sand paper is now worked alternately from left to right, along the whole of the work to avoid spiral scratches forming on the wood; too much pressure will also cause spirals which are very difficult to remove once they have been made. When you come to beads and coves, the sand paper is carefully shaped between the fingers so as to retain the original patterns. Be very careful where the design changes from concave to convex, and where there are fillets, which must be kept clean cut.

The medium grade sand paper is now changed for a finer grade and the whole process repeated. Remember to apply only light pressure as too heavy a touch will wear the sand paper away and not the wood, which is just a waste of time and money. If a super finish is required or there is evidence of sanding scratches, it is a very good idea to use a wad of medium grade steel wool. One big advantage of this material is that it can be used over and over again.

On the market today, there are all sorts of substitutes for sand paper and glass paper. One, for example which comes to mind, is a wire gauze which is very good, but gets blocked quickly and gets one hot round the collar, so I still prefer the old fashioned stuff. It is quite cheap and I do not mind throwing it away, when I have done with it. Garnet paper is very good and retains its cutting power much longer than sand paper but it is more expensive and is not usually stocked at hardware stores or ironmongers, particularly in country districts.

Bowls and faceplate work are treated in a similar manner to work between centres and the sand paper held between fingers and thumb, is presented to the work so that the action of the rotating wood is to take the sand paper away from you, should too much pressure be applied. The inside

of a bowl, for example, is sanded first from the centre outwards and vice versa, taking care at the very centre of the bowl and the sides, where there is cross grain work to sand.

So much, then, for the groundwork, but do not throw all your old pieces of worn paper away. They will come in very useful for another stage in one of my methods of finishing.

Many turned articles rely on the natural beauty of the wood and require no artificial colouring. Walnut, rosewood, lacewood (plane tree), maple, cherry and many other beautiful timbers are best finished with a clear polish, and perhaps the easiest is the wax finish. I am very much in favour of this finish, as it can be carried out completely on the lathe without removing the wood until the whole process is finished. Furthermore, as most woodturners' sheds are full of dust and chips, if we have to apply a varnish or lacquer which is sticky to handle, we shall spend half of our time picking bits and pieces off our partly finished work.

Wax finish. Take a piece of pure beeswax and with the lathe turning at moderate speed, say 2,000 r.p.m., approximately, press the wax into the wood. You will see that we have a mixture of wood dust and wax forced into the grain of the wood and if it is at all open grained, the work will be most satisfactorily filled and, what is more important, the filler thus made will match the wood perfectly and sealed the grain in one operation. Stop the lathe for a moment and inspect your work, if it appears to be streaked with wax, start the lathe up again and use some steel wool, that piece you used in the sanding operation will do, and apply it lightly to the whole of the work. The next stage is to seal in the wax and wood dust, and for this operation we require some clear or white french polish, commercial grade, if you can get hold of some. Garnet or button polish can be used but, unless great care is exercised it will form dirty brown streaks on the work. Make a small pad of some material

that will not fluff, in very much the same way as for normal french polishing, and charge it with french polish. Apply this pad to the revolving work, a small area at a time, recharging the pad when it becomes dry. Continue until the whole area is covered and carry on using the pad until a slight polish is obtained. Stop the work and inspect it and if there is any sign of rough spots due to grain raising, use a little steel wool—not sand paper—to remove these. Apply the second coat of polish and endeavour to work up a reasonable shine but do not be put off if at this stage, your work does not appear to be over brilliant, as the next stage will put matters right. Finally take a block of carnauba wax and apply this to the revolving work to form a thin film over the whole surface of the work. Then, with a bunch of shavings in the palm of your hand, work over the whole turning, so that the heat caused by friction will spread the carnauba wax evenly over the whole work.

It will be apparent that your work has taken a new appearance almost immediately and has a very pleasant shine. To finish off, a light rub over with a piece of artificial silk will complete the process. There is only one small difficulty which may arise in using the carnauba wax. This substance, which originates from Japan, is very hard and brittle and if too much is applied to the work, the whole effect is spoiled. On the other hand, if too much pressure is used when polishing with a rag, the whole application of carnauba wax will be rubbed off, so you see, a little practice is required in this last operation.

This combined wax, french polish, carnauba finish is very durable and attractive in appearance. If it is scratched it can easily be removed with a sharp rub with a piece of cloth. Furthermore, it is non-sticky.

Beeswax can be used on its own and polished with shavings and a cloth but it does not retain its brilliance and is sticky to touch. On the other hand, carnauba can also be used on its own for a very quick finish but it is not very durable

owing to its brittle nature, and if too much is applied, the appearance is apt to be rather white and unnatural.

On the market today, there are numerous prepared wax polishes which are quite suitable for wood finishing, although ordinary shoe polishes take a lot of beating and can be obtained in several shades. A very good polish can be prepared at home using equal parts of beeswax, carnauba wax and turpentine. The carnauba is first powdered and added to the turpentine, the beeswax is shredded and heated until it just melts, and is added to the carnauba and turpentine, allowing the whole mixture to set into a fairly stiff paste. If the wood is previously sealed with french polish, a more lasting brilliance will be obtained.

Filling and sealing. When turnings are made in open grained wood such as oak, chestnut, elm or mahogany, it is always necessary to fill the grain to speed up polishing. French polishing can be used as a filling and sealing operation on its own, but for a quicker finish a separate filler will help a lot, particularly on end grain.

In my previous description of wax finishing, you will have noticed that I used beeswax sanded in as a filler, and this I find to be most satisfactory, even though the work may be french polished. A good paste filler can be made using putty thinned to a paste with turpentine, or any of the packeted fillers used in home decorating will suffice. If a colour is required, add a few drops of stain to obtain the desired shade. Paste fillers should be applied with a rag or brush after the work has been stained to the requisite colour, and left to dry until the appearance of the work takes on a dull look. The work is then turned at slow speed and the filler worked into the wood with a coarse piece of cloth. Allow time to dry and then brush on a sealer coat of french polish.

Sealing the grain is very important particularly after filling and staining, otherwise the wood will just keep on soaking up polish in the open grain portions. Sealing will

also prevent the centrifugal force of the lathe throwing out the filler and stain, and on large diameter turnings such as bases for standard lamps, this quite often happens if the wrong type of stain is used.

Staining. I always prefer to finish woods in their natural colours, but often one wishes to stain some of the less interesting timbers. Various stains are obtainable and each has its uses and some have a few disadvantages, and it must be left to the individual to choose the one which suits his needs. Water stains are made up of soluble crystals which are added to water to the desired shade and are obtainable from most handicraft shops. These have the disadvantage of raising the grain, but they are cheap and will stain most woods satisfactory. Woods of an oily nature do not take water stains well. There is one important feature which must be borne in mind when staining and that is the effect of subsequent applications of polish. Some stains will be removed or the colour changed by the subsequent sealing and polishing and this must be avoided. Water stains, however, behave very well in this respect.

We also have the spirit stains. These are crystals which are soluble in methylated spirits, but again, these have the disadvantage of raising the grain, but their rapid drying qualities give them an advantage over others. Application of french polish on top of a spirit stain will remove some of it and may make turned work appear streaky.

The best stains for amateur use, are, no doubt, the oil or naphtha based stains and are obtainable ready mixed in various shades. Here there is no grain raising and they will take to most wood, although American and English oak can, at times, prove rather difficult. The stain can be applied with a rag or brush and after a few minutes surplus stain is wiped off. The time taken to dry is usually two to three hours. French polish will seal in the stain before subsequent polishing. If french polish or shellac is applied to oil based stain before it is dry, centrifugal force of the lathe,

whilst polishing, will throw out some of the stain and it will be difficult to obtain a good finish.

Cellulose stains and finishing materials are available. They are chiefly used in factories and the furniture trade, but are quite suitable for turnings if a quick finish is required, although there is quite an art in using them by hand, as they are really intended for spray application. Cellulose stains are quick drying and there is little grain raising, but care must be exercised in the choice of materials for finishing. French polish or shellac is again the best for a sealing coat. Cellulose sealers will tend to remove the stain as it is a solvent for other cellulose products. With all finishing methods we must be on the look out for subsequent coats of polish or sealer removing the previous coat. The following will help you in your choice of stains and sealers.

WATER STAINS. Raise grain. Seal with shellac, french polish or cellulose.

SPIRIT STAINS. Raise grain. Seal with cellulose sealer or very quick application of french polish or shellac.

OIL OR NAPHTHA STAIN. Seal with french polish or shellac.

CELLULOSE STAIN. Seal with french polish or shellac.

One thing to remember about cellulose finishes is that they will not dry if applied over wax. If you have used beeswax sanded in as a filler, seal it in with french polish before applying any cellulose.

Finally, there is that old antique finish in oak which can be obtained either by fuming with strong ammonia or by immersing the turning in a can of strong soda water, which will give it a lovely mellow tint. To fume oak turnings, all that is required is a good air-tight box, such as a tea chest, fitted with a lid. Place a small amount of extra strong ammonia in a saucer in the bottom of the box, put in the turnings arranged so that they are not touching each other. Put on the lid and cover with an old, wet blanket and leave

for 24 hours or so. The resulting stained oak will require a straight wax finish to give it that lovely antique appearance, and do not forget to knock it about a bit and, bore a few small wormholes, just to complete the illusion!

French polishing. A french polish, is perhaps, one of the best types of finish suited for lathe work, as the frictional heat generated ensures quick drying and the work can be handled soon after the polish has been applied. In the french polishing of furniture, a great deal of work goes into the preparation of the rubber but for lathe work, we do not require anything quite as elaborate. Two shallow containers, such as tin lids, are needed, one filled with french polish and the other with a little linseed oil. Place these containers by your side, arranged so that you do not have to reach over the lathe to get at them. A piece of lintless cloth or cheese-cloth is rolled up into a pad which can be conveniently held between the fingers. The lathe is now set to operate at about 1,000 r.p.m., but this speed depends on the diameter of the work, to a great extent. For a 10 in. diameter bowl, a slightly slower speed will be required. I am assuming that the wood has been stained and filled and that all the groundwork has been done and it is ready to be polished.

Dip the pad into the french polish and apply a little linseed oil to the pad with one finger; do not over-oil the pad. The object of using linseed oil is to prevent the pad from sticking and also to help spread the polish over the work. With the work turning under power, the prepared pad is brought into contact with the work. The pad is moved progressively along the work, considerable pressure being brought to bear by the fingers and thumb. The pad should be recharged when it becomes dry, and again a spot of oil is applied. Whilst the pad is in use, it should also be squeezed between the fingers, so that the polish in the pad is forced out and on to the revolving wood. You will notice that a shine soon develops on the work and polishing should continue until the whole work is

covered with a good layer of polish. After polishing do not throw your pad away but put a few drops of polish on it and store in a screw-top jar. You will find that when you use it again, you will get a polish much easier and quicker.

Finally, a good buffing with a clean, dry rag will remove any trace of the linseed oil. French polish will take quite well on top of a wax polish, if the surface is first rubbed with steel wool.

If you have several turnings to polish and require a quick finish with the minimum amount of polishing, first of all brush on a good layer of spirit varnish. Spirit varnish in the trade, is called white hard varnish for the clear variety, and brown hard for the darker, and has the consistency of thin syrup. After it has dried hard, which will be in about two hours, remount the work in the lathe, and, turning at about 1,000 r.p.m., flatten the work with steel wool, not glass paper. A quick wipe over with your french polishing pad, will give you a very good polish, although the surface will not be quite so hard as a fully french polished work.

Clear oil varnish can be used for finishing but is not to be recommended.

Cellulose finishing. One hears very little about cellulose being used for lathe work, but when the method has been mastered, a very good hard finish can result. The work should be fully prepared for polishing and sealed with shellac or french polish. This is very important. Cellulose is a very strong solvent for most stains and varnishes but will not affect shellac and spirit based polishes. With the work in the lathe, and turning by hand, quickly brush on two or three coats of clear cellulose lacquer. In between each coat, flatten the surface with steel wool, the work rotating at its slowest speed under power. Stop the lathe and inspect the work for ridges in the polish and remove with steel wool, if there are any. Prepare a small pad out of a piece of chamois leather and apply sufficient cellulose thinners to just moisten

the pad. Cellulose pullover solution is better, if you have a friend in a car spraying shop. With the lathe turning at slow speed, apply the chamois pad to the revolving work and make one very quick, light pass along the whole length of the work. Wait a few minutes and make a second pass in the same direction. On no account must you let the pad stop in any one position, or you will dissolve the previous application of lacquer, then you will have to start all over again.

Bowls can be treated in the same way but, again, make only one quick stroke in one direction. Do not move the pad backwards and forwards as in french polishing. For satisfactory french polishing and cellulose finish, it is most important to have a warm, dry atmosphere in your workshop; a temperature of not less than 60°F should be aimed at. A good indication of the temperature and humidity is to note the appearance of your polished work. If it is too cold and damp a whitish bloom will form. If this occurs, the articles must be repolished when conditions are a little warmer, and the blooming will disappear.

Oil finish. Turned articles such as bowls and plates used for holding food should be finished with salad oil, or a vegetable cooking fat, the wood being thus protected from moisture or odours being retained in the wood. The work should be well sanded to a smooth finish and the oil or cooking fat applied with a clean cloth, with the lathe turning at about 600 r.p.m. A number of applications will be required to build up a long lasting finish. Articles so finished must not be washed but after use a wipe over with salad oil is all that needs to be done. In time the articles will develop a beautiful, mellow appearance.

Novelty finish. Small turned articles, such as one sees in gift shops at the seaside, can be given a colourful and unusual appearance with ordinary stationers' sealing wax. This is applied by supporting the sealing wax on the tool rest and pressing the end against the revolving work, which

should be rotating at about 2,000 r.p.m. Heat caused by friction, will cause the wax to melt, forming ridges of wax in a corded effect. Since sealing wax can be obtained in many colours, it is possible to get a very decorative effect.

All turned work will finish better if a number of days can be left between actual turning and finishing. This allows for any fibres of wood that were flattened by turning, to spring up, thus making subsequent sanding much more effective, but most of you will prefer to turn and finish at the same time.

Spray finish. Most turned articles, as already explained, can be finished completely whilst still on the lathe. However, small articles, consisting of partly turned parts, such as wall brackets and fancy goods, can be finished by the application of a spray polish. Most amateurs have access to a vacuum cleaner operated spray gun and this can be used with quite satisfactory results. After the various parts have been assembled and sanded, and stained where required, the articles should be placed on a narrow board at a convenient height. The spray gun is filled with a mixture of 2 parts cellulose thinners and 1 part sanding sealer. This is a specially prepared product for sealing the grain, which reduces grain raising to a minimum. Use the spray gun with a sweeping action, being careful not to stop in any one position. The solution being of a very thin nature, will require two or three coats at least to give a satisfactory build up.

Allow ten minutes or so between each coat and finally about two hours to dry off. All parts should then be sanded with a very fine grade of sand paper. Then comes the application of the final coats of lacquer. Again mix up a solution consisting of 2 parts cellulose thinners to 1 part clear cellulose lacquer, and apply several coats in a similar manner to the sealer coat. As with other forms of polishing, temperature takes a leading part in obtaining a satisfactory finish. Never attempt spraying if the atmosphere is cold or

damp, or both. 60°F is a satisfactory temperature. To obtain a real high gloss finish, a light rub over with a pad of chamois leather, moistened with cellulose pullover solution, or if this is not obtainable, cellulose thinners, will do the trick. Whatever you use for this operation, keep the pad on the move. If you stop in one place, it will stick and pull off the previous application of lacquer.

Some very attractive finishes can be obtained using spray stains, particularly where various woods have been used together to form one finished object, as in the case of a floor lamp standard.

If you are lucky enough to possess a high pressure spray plant, then the ratio of lacquer to thinners can be increased to equal proportions of each solution.

Finally, there is the dipping method. This is mostly used in the finishing of tool handles and very small parts and is not really suitable for amateur use but the process is quite simple, and perhaps you would like to experiment. The parts to be treated are suspended from a beam of wood and immersed into a bath of a fairly thick cellulose lacquer. The beam with the suspended parts is slowly withdrawn from the lacquer by mechanical means, the parts drying off as they are removed. The amateur may not consider this process a practical proposition, but if you are going to produce a great number of tool handles or similar items, it is worth considering the possibilities.

CHAPTER SIXTEEN

Helpful hints

Dress. Always wear a carpenters' apron or something similar, to protect your clothes from polish and stain which is thrown from the rotating work. Keep your neck-tie well tucked in or do not wear one at all, otherwise you may find your chin in contact with the work and yourself having an enforced, dangerous shave.

* * *

When you have decided upon the particular lathe or machinery you require, be sure replacement parts will always be available and choose a reputable manufacturer. This also applies to tools and accessories.

* * *

Keep a supply of methylated spirits handy for removing french polish from your fingers.

* * *

For your supply of beeswax, contact any of your friends who keep bees. It is usually cheaper this way.

* * *

Carnauba wax can be bought from some handicraft suppliers but I have found the chemists or drug stores most helpful, and their product is more refined.

* * *

Never discard your worn sand paper, keep it for rubbing in beeswax, prior to polishing.

* * *

Grandma's old lisle stockings make the finest polishing cloths.

* * *

Always check that your wood is securely held in your lathe before revolving under power. Eyes and hands are very precious.

Examples of Woods Suitable for Turning

Oak. All varieties have lovely grain and are rich in colour although Japanese oak is rather soft. All finish well.

Sycamore. White, turns very well. Some varieties have very beautiful curly figure. Finishes well.

Elm. Very twisty, beautiful grain. Stains well, but requires plenty of filling. Suitable for salad bowls.

Pine. Very beautiful grain. Requires very sharp tools. Fairly soft, but with hard fibres.

Pear. A really excellent wood for turning but very little character to the grain.

Cherry. Beautiful shades of orange and pink. Turns and finishes well.

Laurel. Turns well. Greeny-brown in colour. Good finish.

Holly. Very white, close, hard grain. Obtainable in small quantities and suitable for laminated work.

Boxwood. A very hard, yellow coloured wood. Very little grain. Obtainable only in small sizes. Suitable for tool handles.

Rosewood. Very hard. Rich purple-brown in colour. Finishes very well.

Walnut (English and American). Deep chocolate brown in colour. The woodturners' favourite.

Mahogany. Varies in colour from pink to dark red. Spanish variety extremely hard.

Plane or Lacewood. Beautiful grain. Yellow-orange in colour. Finishes and works well.

LATHE SPEEDS

Diameter of work inches	*Roughing off r.p.m.*	*General cutting r.p.m.*	*Finishing r.p.m.*
Under 2	900–1,300	2,400–2,800	3,000–4,000
2–4	600–1,000	1,800–2,400	2,400–3,000
4–6	600–800	1,200–1,800	1,800–2,400
6–8	400–600	800–1,200	1,200–1,800
8–10	300–400	600–800	900–1,200
Over 10	300–	300–600	600–900

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